

Vol. XIV

No. 2

# DISSERTATION

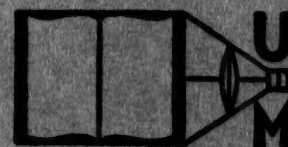
## ABSTRACTS

(formerly MICROFILM ABSTRACTS)

*A GUIDE TO DISSERTATIONS AND  
MONOGRAPHS AVAILABLE IN MICROFORM*

\$6.00 PER YEAR

\$1.50 SINGLE COPIES





## DOCTORAL DISSERTATION SERIES

### Cooperating Institutions

University of Arizona	University of Nebraska
University of Arkansas	University of New Mexico
Bradley University	New York University
Brown University	Northwestern University
Bryn Mawr College	University of Notre Dame
University of Buffalo	University of Pennsylvania
Clark University	Pennsylvania State College
Colorado State College of Education	University of Pittsburgh
Columbia University	Princeton University
University of Connecticut	Purdue University
Cornell University	Rutgers University
University of Florida	St. Louis University
Florida State University	University of South Carolina
University of Illinois (including Chicago Professional Colleges)	Stanford University
Indiana University (including the Graduate Schools of Education and Music)	Syracuse University
State University of Iowa	Vanderbilt University
University of Kansas	University of Virginia
Lehigh University	Virginia Polytechnic Institute
University of Michigan	Washington University
Michigan State College	University of Washington
University of Minnesota	Wayne University
University of Missouri	Yale University
	Yeshiva University



Vol. XIV

No. 2

# DISSERTATION

## ABSTRACTS

(formerly MICROFILM ABSTRACTS)

*A GUIDE TO DISSERTATIONS AND  
MONOGRAPHS AVAILABLE IN MICROFORM*

UNIVERSITY MICROFILMS  
ANN ARBOR, MICHIGAN: 1954



LITHOPRINTED IN THE UNITED STATES OF AMERICA BY  
CUSHING - MALLOY, INC., ANN ARBOR, MICHIGAN, 1954



## INTRODUCTION

DISSERTATION ABSTRACTS is a vital link in the process of publishing doctoral dissertations, since it makes possible the widespread distribution of information concerning the dissertations which are published in their entirety on microfilm, microcards, or microprint.

The degree to which graduate schools in America make use of this publication service, determines the value of DISSERTATION ABSTRACTS as a bibliographical tool. For its fullest use an understanding of the publication procedure is necessary. Briefly this is as follows:

- a. The author submits a carefully typed ribbon copy of the manuscript ready for publication without corrections.
- b. He also submits an abstract of 600 words or less, accurately describing the contents of the manuscript, as a guide, but not as a substitute for the complete dissertation.
- c. Both the abstract and the manuscript must be approved by the candidate's committee and the Graduate Dean as ready for publication.
- d. The manuscript is microfilmed and the negative carefully inspected and put in the vault of University Microfilms for storage, where it is kept available for purposes of duplication upon request.
- e. The abstract is printed in DISSERTATION ABSTRACTS, which is distributed, both in this country and abroad, to a large number of subscribing libraries as well as to leading abstracting services.
- f. The charge for this service is \$20.00 irrespective of the size of the manuscript.
- g. Anyone, after consulting the abstract and concluding the complete manuscript would be of value, can obtain a microfilm copy from University Microfilms at 1 1/4 cents per page, or as a paper enlargement at 10 cents per page.

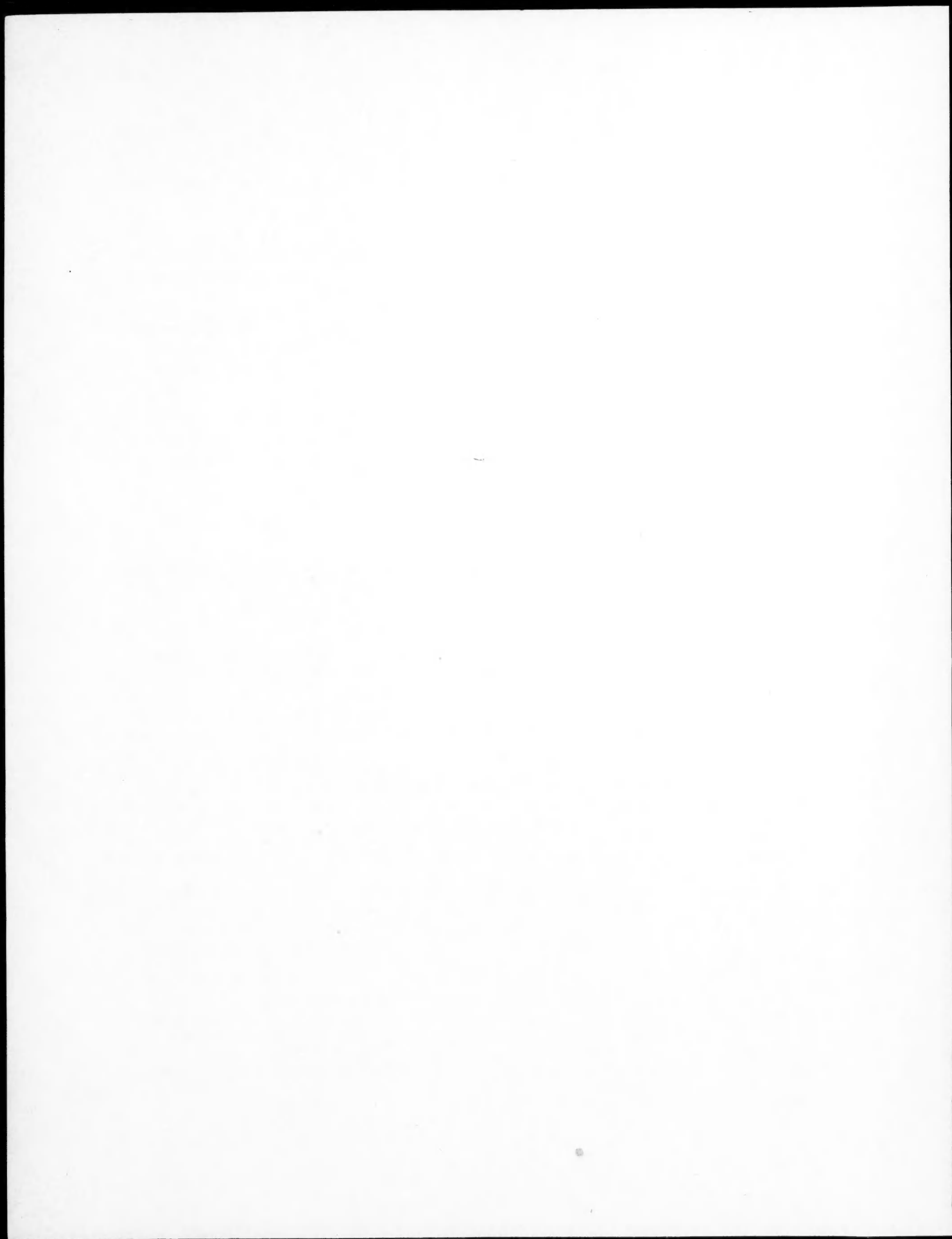
There are varying degrees of partial participation in this plan available at the option of the institution. Titles only will be listed in DISSERTATION ABSTRACTS for a charge of \$2.00 each. When a university wishes to prepare its own negatives according to certain specified standards, and have that negative stored at University Microfilms where it will be available for duplication, the charge is \$12.00, which includes publication and distribution of the abstract and storage of the negative. Conceivably certain institutions will wish not only to prepare their own negatives, but to service copies as well in either microfilm, microcard or microprint. In this instance the abstract will be printed in DISSERTATION ABSTRACTS, and any requests for copies will be forwarded to the servicing institution. Interested institutions should write University Microfilms for further details of this service.

This method separates the two necessary functions of publishing: notification, or the process of informing prospective users of the existence and contents of a manuscript and distribution, or the furnishing of a copy upon demand. Each of these functions pays its own way, since if no one wishes a copy, the investment is small. However, if there is a demand, copies can be produced at current book rates.

It is anticipated that by enlarging the scope of DISSERTATION ABSTRACTS this publication will become of increasing value to librarians and scholars as a research tool. If this ideal is to be realized, close cooperation between sponsoring institutions, doctoral candidates, and University Microfilms is of the utmost importance. Now that the service is available to all Graduate schools regardless of the way its candidates publish their dissertations, it is hoped that the goal of a complete bibliography of doctoral dissertations may be realized within the next few years. Institutions are urged to write for further details.

Beginning with Volume XIV, DISSERTATION ABSTRACTS will be published monthly.





## CONTENTS

Page

### AGRICULTURE

#### AGRICULTURE, GENERAL

- A Study of the Operations and Problems of Non-Inspected Slaughter Plants in Illinois -- Robert Leon Coppersmith. . . . . 211
- Production and Utilization of Milk in Sixteen Southern Illinois Counties -- Alex Reed . . . . . 211

#### AGRICULTURE, ANIMAL CULTURE

- Endocrine Influences on the Development of the Rudimentary Gonad of Fowl -- Walter Kornfeld . . . . . 212
- Study of the Neurogenic Mechanism of LH Release in the Hen -- Ari Van Tienhoven . . . . . 213

#### AGRICULTURE, PLANT CULTURE

- Cellular Development of the Golden Delicious Apple from Blossom to Maturity -- Kenneth Edwin Bell . . . . . 213
- Growth and Development of Lycopersicum Esculentum as Affected by Thermoperiod, Photoperiod, Chemical Growth Regulators and Nutritional Sprays -- Edward Norman Learner . . . . . 214
- Growth, Leaf Composition and Nutrient-Element Balance of Montmorency Cherry (Prunus cerasus, L.)—Effect of Varying Concentrations of Ten Nutrient-Elements -- Roy Kenneth Simons . . . . . 215
- Relationships Between Easily Available Carbohydrates, Nitrogen Recovery, and Growth of Sugar Beets Fertilized with Several Green Manures -- Burleigh Carlyle Webb. . . . . 215

### ANATOMY

- The Muscular Architecture of the Ventricles and Atria of Hog and Dog Hearts -- Carolyn June Eyster . . . . . 216

### ANTHROPOLOGY

- The Pakot (Suk) of Kenya with Special Reference to the Role of Livestock in Their Subsistence Economy -- Harold Kenneth Schneider . . . . . 217

### ASTRONOMY

- A Study of the Atmospheres of Early O and of Stars -- John Beverley Oke. . . . . 217

### BACTERIOLOGY

- The Production of Noninfectious Viral Components in Bacteria Infected with Bacteriophage -- Robert Ivan DeMars . . . . . 218
- Oxygen Tension as a Possible Factor in the Virulence of the Tubercle Bacillus -- L. Ruth Guy . . . . . 218
- Enzymatic Steps in Alpha-Keto Acid Oxidation -- Lowell Paul Hager . . . . . 219
- Oxidation-Reduction Potential Studies on the Rate of Germicidal Activity of Quaternary Ammonium Compounds -- Richard James Harley . . . . . 219



	Page
<b>BACTERIOLOGY -- cont'd.</b>	
The Isolation of Intermediates in the Krebs Citric Acid Cycle in Cheese and Fermented Milks -- Clemence John Honer . . . . .	220
The D-Amino Acid Content of Bacterial Spores and Vegetative Cells -- Norman Lionel Lawrence . . . . .	220
Studies on the Nature and Biological Activity of a Fraction of Bovine Serum Responsible for the Stimulation of Growth of Mycobacteria -- Tom Joseph McBride . . . . .	221
Nutrition and Metabolism of Clostridium Tetanomorphum -- James Hiroto Nakano . . . . .	221
Studies on the Sulfur Nutrition of Lactobacillus Arabinosus -- Tetsuo Shiota . . . . .	222
Studies on the Relationship Between Equilibrium Vapor Pressure and Moisture Content of Bacterial Endospores -- Donald George Waldhalm . . . . .	223
Oxidative Carbon Assimilation by Bacillus Subtilis -- Burton Irwin Wilner . . . . .	223
The Fate of Inositol as an Essential Metabolite for Schizosaccharomyces Pombe -- Henry Floyd Yarbrough, Jr. . . . .	224

## BIOLOGY-GENETICS

### BIOLOGY-GENETICS

On the Behavior Toward Humidity of Drosophila Pseudoobscura and Drosophila Persimilis -- Donald Day Boyer . . . . .	225
The Hydrobiology of the Alviso Salt Ponds -- Lars Hjalmar Carpelan . . . . .	225
A Study of Meiosis in Coelomic and Oviducal Oocytes of Triturus Viridescens, with Particular Emphasis on the Origin of Spontaneous Polyploidy and the Effects of Temperature Shock on the First Meiotic Division -- Asa Alan Humphries, Jr. . . . .	226

## BOTANY

The Growth of Nitzschia Palea as Affected by Certain Organic Materials -- Arthur A. Scharf . . . . .	227
--	-----

## CHEMISTRY

### CHEMISTRY, GENERAL

A Procedure for the Spectrographic Determination of Copper, Tin and Titanium in Iron and Steel -- Edward A. Rowe . . . . .	228
--	-----

### CHEMISTRY, BIOLOGICAL

A Study on the Biological Utilization of the Polyhydroxy Esters of Linoleic Acid -- Howard Minor Hickman . . . . .	228
The Relationship of Dietary Fat and Riboflavin to the Carcinogenic Activity of Paradimethylaminoazobenzene -- Glen Arthur Jacobson . . . . .	228
Phosphorus Metabolism in the Nucleolus of Rat Liver Nuclei -- Darrell Neilsen Ward . . . . .	229
The Stability of Natural Fats as Affected by the Interaction of Phospholipids, Carotenoids and Tocopherols -- Winston Harold Wingerd . . . . .	229

### CHEMISTRY, INORGANIC

The Determination of Trace Quantities of Bismuth. I. Colorimetric Determination of Traces of Bismuth in Lead. II. Colorimetric Determination of Traces of Bismuth in Copper. III. Nephelometric Determination of Bismuth -- Bruce Burton Burnett . . . . .	231
Application of the Spectrophotometric End Point in Volumetric Analysis: The Use of the Visible and Ultraviolet Region of the Spectra -- Philip Bliss Sweetser . . . . .	232

CHEMISTRY -- cont'd.	Page
CHEMISTRY, ORGANIC	
I. Thiophene Derivatives of Hydrazine. II. Synthesis of 1,4-Thenopyrrole-2-Carboxylic Acid -- Louis Albert Carpino. . . . .	233
Mannich Reactions of Pyrimidines -- Harold Marvin Foster . . . . .	234
The Structure of Michael Adducts of 5-Mesitoylacenaphthylene -- Sheldon Ellsworth Frey . . . . .	235
Synthetic Approaches to Radiocholesterol -- Constantine Katsaros . . . . .	236
A Study of Conjugation in the Biphenyl System -- Victor Peter Kreiter, Jr. . . . .	236
The Asymmetric Reduction of Aryl Alkyl Ketones -- Roderick MacLeod . . . . .	238
Reductive Coupling and Polymerization of Unsaturated Amides -- Robert Ervin Putnam. . . . .	238
The Stereochemistry of 2,5 and 2,6 Disubstituted Dioxanes -- James Regis Stephens . . . . .	239
Restricted Rotation in Derivatives of 2-Methyl-1-Naphthylamine -- Karl Viktor Yngve Sundström . . . . .	240
The Acequinoline Nucleus -- Thomas Mabry Veazey . . . . .	240
The Insecticidal Principles of Haplophyton Cimidum -- John Frederick Walker . . . . .	241
I. Copolymerization of Butadiene with Myrcene. II. Copolymerization of Butadiene with Substituted Alkyl Acrylates -- Barbara Joy Hummel Weil . . . . .	242
CHEMISTRY, PHYSICAL	
Mechanism of Aquation of Some Cobalt (III) Complexes -- Charles Ray Boston . . . . .	243
Diffusion in Solutions Containing Glucose and Sucrose -- David M. Clarke . . . . .	243
Nucleation in Supersaturated Vapors -- John Victor Clarke, Jr. . . . .	243
A Multiple Sheared-Boundary Separation Cell and Rotor for the Ultracentrifuge: A Study of Sedimentation in Cells of Cylindrical Shape -- Wallace Ray Deason . . . . .	244
A Magnetic Study of Polymerization Retardation -- Judson L. Ihrig . . . . .	245
Photoelectric and Surface Potential Studies of Reactions of Atoms and Radicals with Solid Surfaces -- Brian Mead, Jr. . . . .	245
Chemical Problems in Radiofrequency Spectroscopy -- David Warren McCall . . . . .	246
Applications of Ultraviolet Spectrophotometry: I. The Determination of Theobromine and Caffeine in Cacao Products. II. Spectrophotometric Titrations -- James William Miles . . . . .	247
Study of Molybdenum, Technetium and Neodymium Radioisotopes -- Robert A. Naumann . . . . .	247
The Reaction Between Oxygen and Hydrazine Vapor -- Charles Isaac Tewksbury . . . . .	248
Nucleation of Supersaturated Potassium Nitrate Solutions -- Malcolm Lunt White . . . . .	249
ECONOMICS	
ECONOMICS, GENERAL	
The Role of the Community in Economic Development -- Frederick Chester Armstrong . . . . .	249
An Investigation of Methods for Measuring Geographical Differences in the Cost of Living -- Elmore Alan Hale. . . . .	250
An Economic Analysis of Irrigation Development with Particular Reference to Multiple-Purpose Development of the Truckee-Carson River System in Western Nevada -- Frank Sanford Scott, Jr. . . . .	251
ECONOMICS, COMMERCE-BUSINESS	
An Analysis of Sales Forecasting Policies, Procedures, and Techniques -- Charles Merle Crawford . . . . .	252



<b>ECONOMICS, COMMERCE—BUSINESS -- cont'd.</b>	<b>Page</b>
Standard Costs and Price Fluctuations -- Gerald Kenneth Nelson . . . . .	252
Women in White Collar Jobs: The Study of an Economic and Social Movement (1910-1950) -- Helen Johnston Recknagel . . . . .	253
The Provision of Disability and Medical Care Insurance Through Collective Bargain- ing: An Analysis of Ten Programs -- Fred Slavick. . . . .	254
Personnel Policies and Practices in Offices with 5 to 100 Employees -- Eldred C. Speck. . . . .	254
Influence of Traditions in Accounting -- Arthur Ramer Wyatt . . . . .	255
<b>ECONOMICS, FINANCE</b>	
An Analysis of the Examination and Other Requirements for the Certified Public Accountant Certificate -- Heimie Edward Breen . . . . .	256
The Role of Money in Aggregate Demand, 1865 to 1900 -- Alan Davis Dailey . . . . .	257
The Northwestern Mutual Life, 1857-1950: An Historical Case Study of Investment Policy and Practice -- Orange A. Smalley . . . . .	257
<b>ECONOMICS, HISTORY</b>	
The Development of Oligopoly in the Farm Implement Industry -- Elvis Luverne Eckles . . . . .	258
The Postwar Development of the Foreign Trade in Southeast Asia, 1946-1952 -- Chi-Tsu Wang . . . . .	259
<b>ECONOMICS, THEORY</b>	
Some Theoretical Aspects of Economic Development and Their Application to Agriculture in Under-developed Countries -- Jyoti Prasad Bhattacharjee . . . . .	260
General Equilibrium Theory and the Incidence of Sales and Excise Taxes -- Esther Virginia Duvall . . . . .	261
Cost Concepts in Marketing: A Study of the Application of Theoretical Concepts of Cost to the Empirical Determination of Cost Behavior in the Individual Marketing Firm -- Robert Grimmer Seymour. . . . .	261
Competition and the Theory of Games -- Martin Shubik . . . . .	262

## EDUCATION

<b>EDUCATION, GENERAL</b>	
The Master's Degree in California -- William Winfield Armentrout . . . . .	263
The Health Teachings and Practices Derived from the Hebrew Bible -- Lewis Leon Berlin . . . . .	263
A Study of Dimensional Orientation as Evidenced Through the Speech of Children in Nursery School, Kindergarten, First and Second Grades -- Lura Minni Sota Carrithers . . . . .	264
Revising a High School Curriculum -- Morris Berdyne Cierley . . . . .	265
An Evaluation of Teaching Job Finding and Job Orientation -- Edward Richard Cuony . . . . .	266
Adapting Guidance Services to Junior High School Needs -- Lane Edward DeLara. . . . .	267
Developing Guidance Services in a Small City Secondary School System -- Lloyd Norman Garrison . . . . .	268
The Religion of College Students with Special Reference to Bradley University Students -- Edward Dwight Gates . . . . .	268
Comparative Study of Two Methods of Learning the Keyboard in the Study of Touch Typewriting -- Philip Sidney Gross . . . . .	269
An Inquiry into the Role of History Textbooks in Improving Understanding of Human Actions -- John Wagner Hanson . . . . .	270
The College Preparatory Program in a Small High School -- Emil Brevard Jones . . . . .	270

<b>EDUCATION -- cont'd.</b>	<b>Page</b>
A Determination of Certain Changes in Parental Understandings, Attitudes, and Interests as Compared with Those of Their High School Children Following a Teaching Unit in Atomic Energy -- George Coe Lorbeer, Jr. ....	271
The Guidance Program in Selected Negro Institutions for Higher Education -- Frederick J. D. McKinney .....	272
The Determination of Those Facts and Understandings Which Should Be Secured by Business Community Surveys: (Including a Suggested Method for Obtaining These)-- Virginia Ernestine Moore .....	272
A Study of the Educational Activities of Selected Industrial, Commercial and Professional Foundations -- Charles Harold Nichols. ....	273
An Examination of Problems Relating to Standards of Value Judgment as Expressed by a Selected Group of Basic College Students -- James Preston Orwig .....	274
A Study of the Objectives in Higher Education of the Six Liberal Arts Colleges of the Church of the Nazarene -- Ralph Edward Perry .....	275
A Junior High School Social Studies Textbook in Four Problem Areas--Labor, Political Parties, Congress in Action, and the United Nations -- David Herbert Reid .....	276
A Study in Social Acceptability: The Relationship Between the Increase of Social Acceptability and the Increase in Social Expansiveness -- Samuel Issac Spector .....	276
A New Abrasion Method for Textile Testing; Comparison of Effects of This Method with Effects of Other Abrasion Machines; and Use of This Method in Textile Teaching -- Evelyn Emma Stout .....	277
A Survey of Business Education in the Public Secondary Schools and the Public Junior Colleges in the State of Kansas -- Ralf Jay Thomas. ....	278
Teacher Self-Reporting Time Study as a Method of Appraisal -- Burton Chatterton Tiffany .....	278
A Plan for a Coordinated Speech and Drama Program for the University Center in Georgia: Recommendations Based on a Survey of Resources and Objectives, and on Opinions of Students and Educators -- Roberta Powers Winter .....	279
<b>EDUCATION, ADMINISTRATION</b>	
A Study of Administrative Practices in Selected Bible Institutions -- Herbert Winston Byrne .....	280
The Nature of Business English -- Carl Herbert Cummings .....	281
Classroom Acoustical Control and the Efficiency of Verbal Communication -- Martin Ted Dixon .....	282
Financing of Special Education in California -- George McCallin Downing .....	283
Administering a Rapidly Growing School District -- George Thomas Egling .....	283
A Study of Current Practices in the Administration, Organization, and Teaching of Business Report Writing and Related Courses in Colleges and Universities of the United States -- Richard Conrad Gerfen .....	284
A Study of Supervisory Services for Business Education as Rendered by Departments of Education in Twelve Southern States -- Frank Murrah Herndon .....	285
The Role of the County Superintendent of Schools in California -- Justus Roland Ingraham, Jr. ....	286
The Role of the High School Principal in the Administration of Teacher Education Programs -- Robert Bankert Kennedy .....	286
Some Characteristics of Developmental Changes in Reorganized School Districts in Illinois -- Joseph Andrew Mason .....	287
The Personnel Administrator in City School Systems: A Study of the Duties and Functions of Personnel Officers and of Administrative Organizational Plans for Personnel Management in Public School Systems in Selected Cities as Compared to Personnel Practices in Other Fields -- Francis J. McCarthy .....	288



<b>EDUCATION -- cont'd.</b>	<b>Page</b>
Characteristics of Boys in a Metropolitan Continuation High School -- James Charles Morena. . . . .	289
Policies and Practices of Illinois School Boards in Respect to the Use of Public School Buildings for Non-School Purposes -- Robert Lyle Reinsch. . . . .	291
The Operationally Defined Role of Trustees in One-Teacher Schools -- Harold Lawson Smith. . . . .	292
A Case Study in Public School Leadership: Herold C. Hunt -- William Max Staerke. . . . .	292
<b>EDUCATION, HISTORY</b>	
A Hundred Years of Civic Education in Washington, 1853-1953 -- Emlyn David Jones. . . . .	293
<b>EDUCATION, PHYSICAL</b>	
The Formulation and Validation of Operational Principles for a National Program of Physical Education for Iran -- Hossein Banai. . . . .	294
Athletic Control in Member Institutions of the Pacific Coast Intercollegiate Athletic Conference -- Robert Arthur Mott. . . . .	295
A Sociometric Analysis of Group Structure and the Effect of Football Activities upon the Patterns of Inter-Personal Relationships -- Joseph Ondrus. . . . .	296
An Evaluation of the Physical Education Service Programs in the Liberal Arts and Teachers Colleges of New York State -- Byron Milo Phillips. . . . .	296
The Relationship Between Research in Physical Education, Interscholastic Athletics, and School Recreation, and the Major Developments in These Fields, 1895 to 1940 -- Edwin Henry Trethaway. . . . .	297
The Relationship of Selected Tests with Energy Metabolism and Swimming Performance -- Wayne Daniel Van Huss. . . . .	298
<b>EDUCATION, PSYCHOLOGY</b>	
A Follow-Up Study of Graduates of Special Classes for Gifted Children -- Walter B. Barbe. . . . .	299
A Comparative Study of Mentally Retarded and Mentally Normal Boys of the Same Mental Age on Some Aspects of the Reading Process -- Lloyd Murray Carson Dunn. . . . .	300
Evaluation of the Education Workshop -- Sumner Burton Morris. . . . .	300
The Relationship Between Achieved Growth in Height and the Beginning of Growth in Reading -- Thomas Pomphert Francis Nally. . . . .	301
The School Adjustment of Children with Aural Acuity Difficulties -- Lyle Gordon Reynolds. . . . .	302
The Relation Between the Perception of Movement on the Rorschach Test and Levels of Conceptualization: An Experimental Study and Theoretical Analysis of Thought Processes Involved in the Perception of Movement on the Rorschach Test -- Irving Schulman. . . . .	303
<b>EDUCATION, TEACHER TRAINING</b>	
Planning a Student Teaching Program for Prospective High School Science Teachers Ralph Lea Beck. . . . .	303
Institutional Appraisal of Five-Year Programs for the Preparation of Secondary-School Teachers -- Elizabeth Jane Boyter. . . . .	304
A Source Book in Training Christian Education Leaders: Prepared for Use in Harding College, a College of the Churches of Christ at Searcy, Arkansas -- Russell Carroll Cannon. . . . .	305
Community Activities of Rural Elementary Teachers: A Study of the Community Participation of Negro Rural Elementary Teachers in Louisiana -- Gladys Blanson Collins. . . . .	306

# CONTENTS

xi

<b>EDUCATION -- cont'd.</b>	<b>Page</b>
An Analysis of the Evaluation, Use, and Value of Certain Competencies for Beginning the Student Teaching Experience -- Ross Jean Fligor . . . . .	307
Teacher Stereotypes in the American Novel -- Arthur Raymond Foff . . . . .	307
The Determination of Content and Procedures of a Bookkeeping Methods Course -- Paul Edward Froehlich . . . . .	308
Professional Activities Performed by College Supervisors of Student Teachers -- Samuel Gerald Gates . . . . .	309
An In-Service Education Program for Teachers of Industrial Arts in New York State: A Study of the In-Service Education Needs of the Industrial Arts Teachers of New York State and Suggested Ways of Meeting These Needs -- James Robert Hastings . . . . .	310
Competences of the Homemaking Teacher in the Secondary Schools of California -- Gertrude Hannah Leuhning . . . . .	310
The Preparation of Teachers for Membership in the Profession -- Elliott Bolte MacCracken . . . . .	311
The Effectiveness of Role-Playing-Discussion in Teacher Training -- Miriam Myrtle Reinhart . . . . .	312
The Homemaking Program for Beginning Teachers -- Gertrude Isabel Roskie . . . . .	313
Development of Principles for In-Service Improvement of Teachers in the Philippines, with Special Reference to Sulu Province -- Maximiliano Aspiras Velasquez . . . . .	313
<b>EDUCATION, THEORY AND PRACTICE</b>	
A Reading Readiness and Preprimer Manual for the Teaching of Beginning Reading in the Urban Primary Schools of Ecuador, South America -- Beatrice P. Ablen . . . . .	316
Junior High School and Non Junior High School Achievement -- Russell Ingram Damon . . . . .	316
The Culture Concept in the Teaching of History -- Shirley H. Engle . . . . .	317
Problems in Writing in College Composition Classes -- Alvin Leon Fellers . . . . .	318
Reading Instruction for Gifted Children in the Elementary Grades -- Eugene Woods Klemm . . . . .	319
An Exploration of Elements Bearing on the Interests of a Selected Group of Elementary School Children with Particular Reference to the Literature of Interest and Development -- Isabel Boyd Lewis . . . . .	320
<b>ENGINEERING</b>	
<b>ENGINEERING, CHEMICAL</b>	
The Photochemical Oxidation of Sulfur Dioxide to Sulfur Trioxide and Its Effect on Fog Formation -- Earl Robert Gerhard . . . . .	321
Characteristics of Turbulent Flow in Ducts with Temperature Gradient -- Richard Warring Kunstman . . . . .	321
The Effect of Pressure on Diffusion in Single Crystals -- Tung Liu . . . . .	322
Condensation in the Presence of Inert Gases -- William Bennett Retallick . . . . .	323
Mass Transfer Between Liquid Drops and a Continuous Liquid Phase in a Countercurrent Fluidized System: Liquid-Liquid Extraction in a Spray Tower -- Charles L. Ruby, Jr. . . . .	323
<b>ENGINEERING, CIVIL</b>	
A Method for Calculating the Natural Frequencies of Continuous Beams, Frames, and Certain Type of Plates -- Anestis Stavrou Veletsos . . . . .	324
<b>ENGINEERING, ELECTRICAL</b>	
A Weighted PCM Communications System -- Edward Bedrosian . . . . .	324



<b>ENGINEERING, ELECTRICAL -- cont'd.</b>	<b>Page</b>
Communications with Clipped Speech Signals -- Theodore Vincent Crater. . . . .	325
Mathematical Analysis and Technique for Non Linear Servomechanism Problems -- Kouan Fong . . . . .	326
Delay-Type Compensators for Control Systems -- Dennis John Ford . . . . .	326
Investigations and Analyses of Some Vibrational Systems Incorporating Non- Linear Elements -- Evan Richard Owen . . . . .	327
Error Detection and Correction in Binary Parallel Digital Computers -- James Evans Robertson. . . . .	328
<b>ENGINEERING MECHANICS</b>	
An Iterative Transformation Procedure for Solving Characteristic-Value Problems in Structural Mechanics -- Myron Lee Gossard . . . . .	329
Analysis of Pressure Surges in Long Pipe Lines Due to Gradual Stoppage of Flow -- Joseph Louis Krahula . . . . .	331
Plastic Bending of Circular Plates Symmetrically Loaded -- Kenneth Ring Merckx . . . . .	331
Elastic Stability of Conical Shells Loaded by Uniform External Pressure -- Charles Edwin Taylor . . . . .	332
Analysis of Toroidal Shells -- Robert J. Timms. . . . .	332
<b>FOOD TECHNOLOGY</b>	
Sweet Corn Dehydration: The Falling-Rate Phase -- Richard Gordon Garner . . . . .	333
Effect of Harvesting Conditions on Mold Count of Black Raspberries -- Kuchibhatla Lakshmi Narasimham . . . . .	333
<b>GEOGRAPHY</b>	
The Temuco Region, a Geographic Study in South Central Chile -- David John de Laubenfels . . . . .	334
Terre Haute, Indiana: A City of Non-Growth -- Robert Roland Drummond . . . . .	335
A Study of the Agriculture and Rural Settlement Pattern of Vigo County, Indiana, with Emphasis on the Impact of Strip Coal Mining -- James Lee Guernsey . . . . .	335
Climate and Climatic Regions of Western Canada -- George Alfred Rheumer . . . . .	336
The Contributions of Alexander von Humboldt to the Science and Study of Physical Geography -- Marie Antoinette Soscie . . . . .	337
<b>GEOLOGY</b>	
Sand Distribution in the Cypress Formation, Clay County and Vicinity, Illinois -- John Judson Chapman . . . . .	338
Geology of the Stanford Range, British Columbia -- Gerald Gordon Lewis Henderson . . . . .	338
Sedimentary-Stratigraphic Analysis of the Oficina Sediments, Greater Oficina, Venezuela -- David Arthur Probst . . . . .	339
The White Creek Batholith and Its Geological Environment in Dewar Creek Map- Area, British Columbia -- John Elgin Reesor . . . . .	339
Geology of the Puertecito Quadrangle, Socorro County, New Mexico -- William H. Tonking . . . . .	339
Oligocene and Early Miocene Nimravid of North America -- Loren Milton Toohey . . . . .	340

HEALTH SCIENCES

Page

HEALTH SCIENCES, GENERAL

- Absence Due to Illness in the Elementary Schools, Redwood City, California  
-- Ralph Mason. . . . . 341

HEALTH SCIENCES, HYGIENE

- Individual Differences in Blood Pressures in One Thousand College Men -- Guido  
Oscar de Ghetaldi, Jr. . . . . 342  
Methods for Teaching Health Education -- Bruce Lyn Hubbard . . . . . 343

HEALTH SCIENCES, PATHOLOGY

- The Distributions of the Duffy, Kell, Kidd, Lewis and S(MN) Blood Factors of the  
American Negroes, with Family Study and Statistical Analysis -- Somsak Phansomboon . . . . . 344

HISTORY

HISTORY, GENERAL

- Public Opinion as a Factor in the Emergence of a National Anti-Trust Program,  
1873-1890 -- Sanford Daniel Gordon . . . . . 345

HISTORY, MODERN

- Matthias Erzberger and German Politics, 1914-1921 -- Bruce Bradford Frye . . . . . 345  
Charles-Louis de Saulces de Freycinet and the Army of Metropolitan France -- 1870-1918:  
A Study in the Politics of Military Security -- Edward Lawrence Katzenbach, Jr. . . . . 346  
José Vasconcelos and the Mexican Revolution of 1910 -- Richard Baker Phillips . . . . . 347  
The Reform of Suffrage and Representation in New Jersey: 1774-1844 -- Jack Richon Pole . . . . . 348  
Zwinglianism in England During the Reign of Elizabeth -- Melvyn Eugene Pratt, Jr. . . . . 348  
The Origins of the Mouvement Républicain Populaire -- Kathryn Roberta Street . . . . . 349  
Chilean Parliamentary Government, 1891-1924 -- Jordan Marten Young . . . . . 350

LANGUAGE AND LITERATURE

LANGUAGE AND LITERATURE, GENERAL

- Anima and Affectus: Theories of the Emotions in Sixteenth Century Grammar  
Schools and Their Reflections in the Works of Shakspeare -- Rolf Hans Soellner . . . . . 351  
An Introduction and Annotations for a Critical Edition of 'Amelia' -- Augustus  
Robert Towers, Jr. . . . . 351

LANGUAGE AND LITERATURE, CLASSICAL

- The Heraclidae of Euripides: An Introduction and Commentary -- Elizabeth Patricia  
Neils Boulter . . . . . 352  
The Influence of the Classics on the Poet Wieland -- Theodore Henry Mueller . . . . . 353

LANGUAGE AND LITERATURE, MODERN

- A Study of the Use of Emotional and Intellectual Imagery in the Novels of George  
Meredith -- Deborah Sands Austin . . . . . 353  
The Ethical Element in Literary Criticism of the English Renaissance -- Helen  
Margaret Condon. . . . . 354  
A Textual and Critical Edition of Hawthorne's Blithedale Romance -- Maurice Aaron Crane. . . . . 355  
The Picaresque Tradition in English Fiction to 1770: A Study of Popular Backgrounds,  
with Particular Attention to Fielding and Smollett -- Harold Kelly Crockett . . . . . 355

<b>LANGUAGE AND LITERATURE -- cont'd.</b>	<b>Page</b>
A Study of American Anti-Slavery Journals -- Joseph Anthony Del Porto. . . . .	356
English Dramatic Critics of the Nineties and the Acting of the "New Theatre" -- Flora Elizabeth Emerson . . . . .	356
Milton's Residences and Real Estate Holdings -- Paul Egidius Grabill . . . . .	357
Browning and Impressionism -- Charles Vincent Hartung . . . . .	358
Vital and Artistic Dimensions of the <u>Cartas Marruecas</u> of José Cadalso -- John B. Hughes. . . . .	358
Naturalism in the Mexican Novel -- Francis Xavier Maggipinto . . . . .	359
The English May Lyric: Its Background and Development to the End of the Seventeenth Century -- Edward Reams Mitchell . . . . .	359
José Francisco de Isla, Jesuit Satirist of Pulpiteers in Eighteenth-Century Spain -- Russell Perry Sebold, III . . . . .	360
<b>LANGUAGE AND LITERATURE, LINGUISTICS</b>	
A Study of Verb Form and Verb Uses in Certain American Writings of the Seventeenth Century -- Orville Lawrence Abbott . . . . .	361
The Linguistic Category of Emphasis in Colloquial Spanish -- Richard Beym . . . . .	362
The <u>Epitome Troporum ac Schematum</u> of Joannes Susenbrotus: Text, Translation, and Commentary -- Joseph Xavier Brennan . . . . .	362
An Experimental Study of the Ability to Select Words to Convey Intended Meaning -- Thomas Edward Finfgeld . . . . .	363
<b>MATHEMATICS</b>	
Strong Ordering in the Self Adjoint Operator Space -- Robert Marvin Baer . . . . .	364
The Concept of a Rigid Body in Special Relativity -- Gerald Henry Fraser Gardner. . . . .	364
Some Theorems on N-Person Games -- Donald Bruce Gillies . . . . .	365
Bessel Functions of Matrix Argument -- Carl Samuel Herz . . . . .	365
Constant Speed Flows -- Louis N. Howard . . . . .	366
Banach Spaces and the Perturbation of Ordinary Differential Equations -- George Hufford . . . . .	366
Sequential Decisions Involving the Choice of Experiments -- Craig Ardith Magwire. . . . .	366
Quadratic Forms Over Local Fields -- Onorato Timothy O'Meara . . . . .	367
Additive and Non-Additive Set Functions -- Lloyd S. Shapley . . . . .	367
Confidence Regions for the Location of the Vertex in Quadratic Regression -- David Lee Wallace . . . . .	367
On the Backward Extension of Moment Sequences -- Fred Marion Wright . . . . .	368
<b>MINERALOGY</b>	
Heavy Detrital Minerals in Stream Sands of the Eastern Sierra Nevada, Between Leevining and Independence, California -- Daniel Reeves Shawe. . . . .	369
<b>MUSIC</b>	
The Early Development of Instrumental Music in Selected Public High Schools of Seven North Central States -- Cyrus Paul Harper . . . . .	370
Stylistic Characteristics in A Capella Composition in the United States, 1940-1953: As Indicated by the Works of Jean Berger, David Diamond, Darius Milhaud, and Miklos Rozsa -- Robert M. Larson . . . . .	371



# CONTENTS

xv

## PHILOSOPHY

Page

William James's Theory of Religious Knowledge -- John Beattie Harrington. . . . .	372
A Study in Perception -- Cecil Garland Stewart McKeown . . . . .	372
Ends and Means, with Reference to Teleology in General -- David John Sachs. . . . .	373
A Study of Philosophical Analysis, with Special Reference to Russell's Analysis of the External World -- Jerome Arthur Shaffer . . . . .	374

## PHYSICS

### PHYSICS, GENERAL

Electron Distributions in Irradiated N-Type Semiconductors -- Harold Glaser . . . . .	375
The Compound Reflection X-Ray Microscope -- Howard Hunt Pattee, Jr. . . . .	376
A Theoretical Analysis of Acoustic Wave Modes in Layered Liquids -- Jack Leslie Stone . . . . .	376
Relativistic Theory of Extended Charged Particles -- Marvin A. Weinstein . . . . .	377

### PHYSICS, ELECTRONICS & ELECTRICITY

A Method for Reducing the Doppler Width of Microwave Spectrum Lines -- George S. Newell, Jr. . . . .	377
Hall Effect in Insulating Photoconductors -- Alfred Guillou Redfield . . . . .	378
The Kinetics of Anodic Films with an Appendix on the Schlieren Microscope -- Lee Palmer Stephenson. . . . .	378

### PHYSICS, NUCLEAR

Nuclear Induction Signals Below the Noise Level -- David Harrison Garber . . . . .	378
An Investigation of the Alpha-Gamma Angular Correlation in the Decay of ThC (Bi <sup>212</sup> ) -- John Wesley Horton . . . . .	379
The Scattering of Two Dirac Particles -- James Macoun Kennedy. . . . .	379
The Phase-Shift Analysis of Nuclear Cross-Section Data -- Harry Lustig . . . . .	380
An Experimental Investigation of Positronium -- Thomas Alexander Pond . . . . .	381
The Radiations from Ce <sup>144</sup> -- Ira Pullman . . . . .	381

## PHYSIOLOGY

Electrolyte Movement in Rabbit Polymorphonuclear Leukocytes -- Harold George Hempling. . . . .	382
Electrical Activity in the Uterus of the Rat -- Carlton Earl Melton, Jr. . . . .	382
An Exploration of the Role of Muscle Temperature in the Control of Breathing During Exercise -- Donald Pryse Morgan. . . . .	383
Effects of Beef Hypothalamic Extracts on Water and Food Intake, Urine Output, and Blood Sugar Levels in Rats -- Morton Benjamin Waitzman. . . . .	384

## POLITICAL SCIENCE

### POLITICAL SCIENCE, GENERAL

Party Developments in Turkey, 1945-1950 -- Suna Kili Derya . . . . .	384
Extraterritorial Powers of Municipalities in the United States -- Russell Webber Maddox, Jr. . . . .	385
Richard Cobden and Cordell Hull: A Comparative Study of the Commercial Policies of Nineteenth Century England and Contemporary United States -- Jaan Pennar. . . . .	386

POLITICAL SCIENCE -- cont'd.	Page
The Labor Government and British Industry, 1945-1951 -- Arnold Austin Rogow. . . . .	386
POLITICAL SCIENCE, PUBLIC ADMINISTRATION	
Policy Formation in the Appropriation Process, with Special Emphasis on the House Appropriations Committee -- Robert Sidney Friedman . . . . .	387
The Use of the Licensing Power by the City of St. Louis, Missouri -- John Ernest Swanson. . . . .	388
POLITICAL SCIENCE, SOCIALISM, COMMUNISM, ANARCHISM	
The Non-Communist Left in Post War France: An Interpretive Study in Doctrinal Intransigence and Inflexibility as Exemplified by the Socialist Party and Non-Communist Syndicalism -- Edwin Drexel Godfrey, Jr. . . . .	389
PSYCHOLOGY	
PSYCHOLOGY, GENERAL	
Dianetic Therapy: An Experimental Evaluation: A Statistical Analysis of the Effect of Dianetic Therapy as Measured by Group Tests of Intelligence, Mathematics and Personality -- Harvey Jay Fischer . . . . .	390
Intolerance of Ambiguity in the Interpersonal and Perceptual-Cognitive Aspects of Personality -- Barclay Cluck Martin. . . . .	390
An Investigation of the Relationship Between Aspirations, Expectations, and Socioeconomic Background of Male High School Juniors and Seniors -- Jerome Martin Seidman . . . . .	391
Class Differences in Prejudice -- Earl Robert Zack . . . . .	392
PSYCHOLOGY, CLINICAL	
An Investigation of Differential Decrement in the Intelligence of Schizophrenics -- Arnold Binder. . . . .	392
The Alpha Index in the Electroencephalogram and Movement Responses on the Rorschach and PMS Tests -- Charles S. Brudo. . . . .	393
Cultural Differences in Personality Structure as Expressed in Drawings of the Human Figure -- Alene J. Davidson . . . . .	394
The Effect of Selected Incentive Conditions on the Performance of Psychopathic, Neurotic, and Normal Criminals in a Serial Rote Learning Situation -- George William Fairweather . . . . .	394
Personal Problems of Junior High School Children in Relation to Intelligence, Socioeconomic Status, Sex and School Grade -- Paul Leroy Hill. . . . .	395
Test Performance as Related to Order of Item Difficulty, Anxiety and Intelligence -- Kenneth Wilhelm Lund . . . . .	396
A Psychosometric Investigation into Problems of College Freshmen -- William G. Meyer . . . . .	396
The Effect of Testosterone Upon Certain Aspects of Personality in Male Paraplegics -- Julian S. Myers. . . . .	397
A Study of the Concept of the Idealized Image in Relation to Similar Concepts and to Certain Psychological Experiments -- Robert Killian Robison . . . . .	398
The Effectiveness of a Rorschach Prognostic Scale for Predicting Results in Psychotherapy: A Study of the Relationship Between a Rorschach Prognostic Rating Scale, and the Improvement Status of Psychoneurotic and Ambulatory Schizophrenic Veterans Undergoing Individual Psychotherapy -- Harry Rockberger. . . . .	399
A Comparative Evaluation of the Reactions to Frustration of Delinquent and Non-Delinquent Male Adolescents -- A. Eugene Shapiro . . . . .	400
An Investigation of Some Personality Correlates During the Clinical Course of Tuberculosis -- John Henry Vitale . . . . .	401

PSYCHOLOGY -- cont'd.

Page

PSYCHOLOGY, EXPERIMENTAL

Tests for Effects of Ionized Air and Electroconvulsive Shock on Learning and Innate Behavior in Rats -- Frank Joseph Bauer . . . . .	401
Secondary Drive as a Neutralizer of Time in Integrative Problem Solving -- Vertus Edwin Bixenstine . . . . .	402
Children's Patterns of Responses in Relation to Criteria of Adjustment -- James Franklin Carruth . . . . .	403
A Developmental Study of Motion Perception, Size Constancy, Recognition Speed, and Judgment of Verticality -- Robert Durand Edgren . . . . .	403
Some Personality Correlates of the Learning of the Galvanic Skin Response -- Herman Yale Efron . . . . .	404
Set or Perceptual Defense? -- James Thomas Freeman . . . . .	405
Measurement of the Ability to Discriminate Between Inferential and Descriptive Statements -- William Valentine Haney . . . . .	405
A Comparison of Factor Patterns in a Native Language and an Auxiliary Language -- James Foster Kamman . . . . .	406
A Quantitative Investigation into the Nature of Identification -- Lionel Mordecai Lazowick . . . . .	407
Sensory Pre-Conditioning and Stimulus Habituation -- John Daniel Lyons . . . . .	407
Vectoring Aircraft by Radar: The Effect of Load and Speed Differences on Controllers' Performance in a Simulated Air Traffic Situation -- Beatrice Johnson Matheny . . . . .	408
Perceptual Variables as Influenced by Manifest and Threat-Induced Anxiety -- John Weldon Moffitt . . . . .	408
Transfer of Training as a Function of Task Complexity -- Malcolm Luther Ritchie . . . . .	409
A Study of the Effects of Sodium Chloride and Hydration on a Monosynaptic Reflex Pathway in the Spinal Cord of the Albino Rat -- Matthew John Wayner, Jr. . . . .	409

RELIGION

A Curriculum Structure for Older Persons in the Church Based Upon a Study of the Opinions of Ministers and Older Persons -- Charles Wesley Garrett . . . . .	410
--	-----

SOCIAL PSYCHOLOGY

Action Theories in Human Relations: An Investigation of Selected Action Theories and Reported Cases Describing Change in Undemocratic Attitude and Behavior -- John Joseph Donovan . . . . .	411
The Context of Assertions as a Determinant of Attitudinal Responses -- William Gordon Leary . . . . .	411
Involvement as a Basis for Stress Analysis: A Study of High School Teachers -- Chandler Washburne . . . . .	412

SOCIOLOGY

SOCIOLOGY, GENERAL

An Analysis of the Social Power Position of the Real Estate Board in Grand Rapids, Michigan -- Donald Herbert Bouma . . . . .	413
---	-----



SOCIOLOGY -- cont'd.	Page
SOCIOLOGY, PUBLIC WELFARE	
Legal Responsibility of Parents for Juvenile Delinquency in New York State -- Irving Arthur Gladstone. . . . .	414
SOCIOLOGY, RACE QUESTION	
The Emotional Problems of Negro High School Youth Which Are Related to Segregation and Discrimination in a Southern Urban Community -- Baker Michael Hindman . . . . .	414
SPEECH — THEATER	
SPEECH, THEATER	
Samuel Phelps and His Management of Sadler's Wells Theatre -- Shirley Seifried Allen . . . . .	415
An Experimental Study of the Relative Effectiveness of Selected Means of Handling Evidence in Speeches of Advocacy -- Robert Stephen Cathcart. . . . .	416
An Audiometric Study of Otosclerosis with Emphasis on Evidences of Sensory-Neural Change -- Frederick Martin Chreist. . . . .	417
An Analytical and Historical Investigation of the Staging of Restoration Comedy as Related to Modern Revivals -- Gregory Alexander Falls . . . . .	417
An Audiological and Otological Investigation of Normal Hearing Individuals with a Family History of Clinical Otosclerosis -- Albert Bruce Graham . . . . .	418
A Theory of Humor for Public Address -- Wilma Horrell Grimes . . . . .	419
The Concept of Equality in the Speeches of Selected Speakers Between the Revolutionary War and the Civil War -- Anthony Hillbruner. . . . .	420
An Evaluation of the Educational Significance of the Children's Theatre of Evanston -- Charles A. Jones. . . . .	420
The Theatre in Relation to Art and to the Social Order from the Middle Ages to the Present -- Daniel Spartakus Krempel. . . . .	421
A Study of the Speech Sound Ability and Intelligibility Status of a Group of Educable Cerebral Palsied Children -- Ruth Mary Lencione . . . . .	422
The Communication Survey: A Study of Communication Problems in Three Office and Factory Units -- Thomas Robert Nilsen. . . . .	423
The Public Speaking of William H. "Alfalfa Bill" Murray -- David Clinton Ralph . . . . .	424
The Preaching and Speaking of Burris Jenkins -- Harold C. Svanoe . . . . .	424
ZOOLOGY	
Biological Studies on <u>Tetramitus Rostratus</u> Perty, with Special Reference to Nutrition and Amoeba-Flagellate Transformations -- Morgan McKenzie Brent . . . . .	426
A Revision of the Acrolophidae (Microlepidoptera) of America North of Mexico Based on the Male Genitalia -- Frank Flinn Hasbrouck, Jr. . . . .	426
Studies on the Life History of <u>Lepidodermella Squammata</u> (Dujardin, 1841) -- Martin Sacks . . . . .	427
Experimental Fertilization of Michigan Trout Lakes -- Howard Allen Tanner . . . . .	427

## AGRICULTURE

### AGRICULTURE, GENERAL

#### A STUDY OF THE OPERATIONS AND PROBLEMS OF NON-INSPECTED SLAUGHTER PLANTS IN ILLINOIS

(Publication No. 6928)

Robert Leon Coppersmith, Ph.D.  
University of Illinois, 1953

This study covered a sample of 70 plants ranging in size from 45,000 pounds live weight to almost 12 million pounds. The sample was drawn from a list of 858 slaughter permits issued by the Office of Price Stabilization.

The nature of operations of non-inspected plants indicated that firms in the sample should be analyzed on the basis of method of distribution of the finished products, i.e., wholesale, retail, and locker-custom. As a result, the sample was divided into three groups, wholesale, retail, and locker-custom, and these groups were analyzed and compared as to class and grade of livestock bought, types of buyers, sources of purchases, production per employee, and number of salesmen used by various firms. In addition to the analysis of operations, a section of the study was devoted to a discussion of the problems in producing and marketing by-products in so far as these problems were applicable to the small slaughtering industry.

#### Summary and Conclusions

Non-inspected slaughter plants, in general, killed a higher percentage of cows and bulls than do federally inspected plants. The class and grade of cattle killed by non-inspected plants depended on the type of market outlet available. The larger plants tended to operate sausage-manufacturing kitchens, and since lower grade animals are superior for the manufacture of sausage, these plants utilized more of these grades than did non-sausage manufacturing plants.

The sources of purchases and types of buyers used by plants in this study were closely related to size of operations. In general, smaller plants tended to buy most of their livestock from farmers and the purchasing was done by the owner or manager. In larger plants terminal markets became more important as a source of supply and company buyers were employed.

Non-inspected plants found it difficult to produce and sell by-products efficiently in competition with larger inspected packers. The major by-product problems considered were (1) hides, (2) lard, and (3) inedible products other than hides.

#### Possibilities and Limitations of Non-Inspected Plants in This Study

Non-inspected slaughter plants have limitations both in production and marketing of their products. The production limitations are more pronounced in the case of by-products than for meat products, since

in most cases volume is not sufficient to justify the equipment and personnel needed to produce high-quality lard and hides.

The limitation on market outlets for products of small packers depends on not only economic influences but also on legal factors. Inspection laws of the federal government and the City of Chicago limited the markets of all plants in the study to the State of Illinois exclusive of Chicago.

The greatest possibilities for non-inspected slaughter plants seem to be in developing specialized slaughter operations of lamb and veal, since specialized equipment and personnel are not required to the same extent as they would be for the slaughter of other species of animals. In addition to specialized slaughter operations, small plants may improve their relative position through capitalizing on any cheaper labor cost or local market advantages that may exist in the local area.

Microfilm copy of complete manuscript of 180 pages, \$2.25. Enlargements 6" x 8", 10¢ per page. Library of Congress card number MicA54-301.

#### PRODUCTION AND UTILIZATION OF MILK IN SIXTEEN SOUTHERN ILLINOIS COUNTIES

(Publication No. 6975)

Alex Reed, Ph.D.  
University of Illinois, 1953

The area involved in this study consists of the southernmost sixteen counties of Illinois. The study considers the production, distribution, and utilization of milk from 1899 to 1952. Purposes of the study are to review developments in the dairy industry in their relation to the overall economy of the area. The chief sources of data are the United States Census and Bureau of Agricultural Economics. Data pertaining to seasonality of production were provided by Prairie Farms Creamery at Carbondale. Data on per capita consumption of fluid milk in Carbondale and Murphysboro were obtained from dairies distributing milk in those towns.

The sixteen county area is strategically located in relation to potential markets for fluid milk. Rainfall and temperature are favorable to dairying in the area. Topography is rolling to rough with soils of low fertility which respond well to treatment. The area is well adapted to pasture and hay crops. Average size of farm is about 125 acres. About 83 percent of the farms are operated by owners or part owners. There is usually a surplus of labor in the area.

Dairying has developed slowly in the area. In 1950 there was an average of four cows per farm as



compared to the state average of eight and the Chicago area average of eighteen. Grade A farms in the sixteen county area have an average of about eighteen cows per farm. Average production per cow in the area is about 4500 pounds compared with a state average of 5500 pounds.

The change to marketing of milk in fluid form has been much slower in the sixteen county area than in other areas in the state. About 41 percent of the milk produced in the area in 1949 was marketed as fluid milk as compared with 80 percent in the St. Louis area and 70 percent for the state. Twenty-six percent of the milk produced in the area in 1949 was marketed as farm cream as compared with 14 percent for the state.

The sixteen county area possesses the physical and economic attributes for expansion of dairying. In general dairying competes for land less favorably with grain crops than with other types of livestock. Areas bordering the Ohio and Mississippi rivers will continue to be predominantly grain and livestock areas. Dairying should be expanded in the remainder of the area. On farms of less than 160 acres in size dairying can compete successfully for the use of land.

Average production per cow should be increased. Heavy culling of low producers and improved feeding and management of the better producers is essential. Use of improved pastures and grass silage will improve the feeding program on many farms. Use of artificial insemination should be extended to improve production through breeding. Size of herd can be increased without increasing labor requirements by adoption of the parlot type operation for milking. The sixteen county area is close enough to St. Louis to supply fluid milk to that city if milk cannot be marketed in the area. The use of quantity discounts and a store-price differential should increase milk consumption in the area. Expansion of manufacturing and industrial operations in the area will help to increase milk sales because of increased buying power. Another possible outlet for increased production may be as concentrated milk shipped to Southern and Southwestern markets.

Increased production per cow, more cows per herd, and improved marketing facilities should make dairying a potentially more profitable enterprise in the sixteen southern Illinois counties.

Microfilm copy of complete manuscript of 132 pages, \$1.65. Enlargements 6" x 8", 10¢ per page. Library of Congress card number MicA54-302.

## AGRICULTURE, ANIMAL CULTURE

### ENDOCRINE INFLUENCES ON THE DEVELOPMENT OF THE RUDIMENTARY GONAD OF FOWL

(Publication No. 6956)

Walter Kornfeld, Ph.D.  
University of Illinois, 1953

The right gonad of female domestic fowl fails to develop beyond the period of embryonic sex differentiation. Instead it regresses and persists as a rudimentary structure. Because this rudiment hypertrophies invariably following sinistral ovariectomy it must be assumed that the left ovary is involved in the *in vivo* regulatory mechanism which inhibits the growth of the right gonad. It was the purpose of this investigation to provide experimental evidence of such a mechanism and to study endocrine effects upon the growth and maintenance of the compensatory gonad in ovariectomized fowl.

Female White Leghorns, received from various sources when one day old, were used in all experiments. Ovariectomies were performed from 5 to 27 days after hatching and the effect of hormone therapy was subsequently studied in the absence of the left gonad. All hormones were given by subcutaneous injections once daily.

Comb size (length times height) was used as a measure of the level of androgen secretion, while oviduct weights served as an index of the level of estrogen secretion.

At the termination of each experiment all birds were sacrificed. All oviducts were dissected out, fixed, and weighed. All macroscopically distinct rudiments and all structures suspected of being gonadal regeneration were dissected out, fixed, weighed, and prepared for histological examination.

Only data collected from apparently healthy, completely ovariectomized birds were analyzed statistically.

Of the compensatory gonads developed by 89 ovariectomized controls 64 were testes, 9 were ovaries, and 16 were ovotestes. Observation of comb coloration suggests that androgen secretion by these structures began over a period of time ranging from about 65 to 124 days of age. A major spurt of gonadal growth and endocrine activity occurred between the ages of 106 and 180 days.

It was possible to inhibit the growth of the right gonad of ovariectomized chickens with estrogen and, to a lesser extent, with androgen. Progesterone had no effect. Even the lowest dosage of estrogen (2 gamma estradiol cyclopentylpropionate, Upjohn, per 100 Gm of body weight per day) which apparently fell below the threshold for oviduct stimulation, prevented the hypertrophy of the rudiment in 7 of 9 cases.

An assay, based on the uterine response of spayed, immature rats, demonstrated that an extract of the blood of 16 to 20 day old chicks had considerable estrogenic activity.

The adequacy of a 'physiological' dose of estrogen coupled with the demonstration of its presence at an



age of sexual 'inactivity' indicates strongly that estrogen is involved in the *in vivo* mechanism of rudiment inhibition.

Prolactin, too, was found to depress rudiment hypertrophy in ovariectomized birds. Its mode of action, known to be antagonistic to that of FSH, may be similar to that of estrogen in the inhibition of the right gonad.

Injection of no less than 6 gammas per 100 Gm of body weight per day of the estrogen preparation cited above, failed to depress the weight of testicular compensatory gonads about 140 days after ovariectomy. Data collected from birds with compensatory ovaries or ovotestes were excluded from the statistical analysis, since their small number was not evenly distributed among treated groups and since oviduct weights suggested that these birds had a higher level of endogenous estrogen than was observed in the rest. All the evidence indicates that estrogen sensitivity decreases with time. This helps to explain that compensatory gonads can, and ultimately do secrete considerable amounts of estrogen.

Hypophysectomy, performed about 5 months after sinistral ovariectomy, very significantly depressed the mean weight of testicular compensatory gonads as well as their androgen secretion.

All attempts to accelerate the growth of the compensatory gonad with mammalian gonadotrophin, or to maintain it with such preparations in ovariectomized, hypophysectomized birds, have failed.

Microfilm copy of complete manuscript of 71 pages, \$1.00. Enlargements 6" x 8", 10¢ per page. Library of Congress card number MicA54-303.

#### STUDY OF THE NEUROGENIC MECHANISM OF LH RELEASE IN THE HEN

(Publication No. 6990)

Ari Van Tienhoven, Ph.D.  
University of Illinois, 1953

Huston and Nalbandov (1953) observed that a thread placed in the magnum of laying hens inhibited the release of ovulation inducing hormone from the hypophysis. Experiments were carried out to test the effect of a thread in different parts of the oviduct, on inhibition of ovulation in the hen. In general, the results obtained by Huston and Nalbandov (1953) were confirmed. However, the number of eggs laid by a group of hens with a thread in the upper magnum was significantly larger ( $P < 0.05$ ) than for a group with a thread in the isthmus.

It was found that injection of follicle stimulating hormone in hens, in which ovulation was inhibited with a thread placed in the isthmus, caused atresia of follicles.

Experiments, conducted to investigate whether progesterone induces ovulation through a neural mechanism, showed that an adrenergic agent is involved in this ovulation inducing process. Dibenamine, at the dosage level of 30 mgm./kg., blocked proges-

terone induced ovulation in 92.3 per cent of the cases ( $P < 0.01$ ).

Dibenamine, at the same dosage level, also inhibited the "spontaneous" ovulation of the first egg of the clutch. It was found that the incidence of blockade of ovulation decreased when the time intervals between Dibenamine administration and expected ovulation time decreased. When Dibenamine was given 12 hours before expected ovulation, a very low number of ovulations was blocked. The reason for the comparative failure of blockade at 12 hours is unknown.

The results obtained lead to the conclusion that:

1. quantitative differences exist between different parts of the oviduct of the hen with respect to the efficiency of inhibition of ovulation;
2. progesterone induces ovulation in the hen through a neural mechanism;
3. the ovulation of the first egg of a clutch can be most effectively blocked when Dibenamine is injected 14 hours before expected ovulation. This suggests that the stimulation for hypophyseal release of ovulation inducing hormone occurs about 14 hours before ovulation.

Microfilm copy of complete manuscript of 58 pages, \$1.00. Enlargements 6" x 8", 10¢ per page. Library of Congress card number MicA54-304.

#### AGRICULTURE, PLANT CULTURE

##### CELLULAR DEVELOPMENT OF THE GOLDEN DELICIOUS APPLE FROM BLOSSOM TO MATURITY

(Publication No. 6917)

Kenneth Edwin Bell, Ph.D.  
University of Illinois, 1953

In an effort to make a basic approach to the solution of the problem of shrivelling and russetting of the Golden Delicious apple, the cellular development of the fruit tissues was studied. Samples of the fruit were collected at weekly intervals during the 1952 season and a study was made of their cellular development. Those collected on May 10, June 4, July 3, August 29, and October 9 were chosen for detailed study.

One week after blossom the fruit cuticle was uniformly 3 to 4  $\mu$  thick. It increased in thickness until fruit maturity, when it was 13 to 15  $\mu$  thick. About June 4 and continuing until fruit maturity on October 9 the cuticle was deposited on the radial walls of the epidermal cells, extending down between the cells until eventually it reached the hypodermis. By late August the cuticle had extended down and around epidermal cells, isolating either single cells or groups of cells.

At the beginning of the season the epidermis consisted of a tightly packed layer of columnar, radially-elongated cells. However as the season progressed

the cells began to stretch tangentially so that after mid-season the cells were definitely tangentially elongated, with approximately the same radial dimensions as they had one week after full bloom. By fruit maturity the epidermal layer had become badly disorganized, with the cells separated from each other and even surrounded by cuticle and distorted into angular or crescent shapes.

The hypodermal layer lies immediately under the epidermis. One week after full bloom it consisted of a region of isodiametric, relatively thick-walled cells. As the season progressed their tangential dimensions increased greatly, until at maturity these dimensions were two or three times as great as the radial. One month after bloom the cells appeared somewhat brick-shaped in transverse or longitudinal section. As the fruits approached maturity the layer became more and more loosely organized, and the cell walls became thicker. At maturity the layer was from three to five cells thick.

The cells of the cortex at one week after full bloom were isodiametric, thin-walled, and with diameters of 23 to 25  $\mu$ . Intercellular spaces were prominent as early as one month after full bloom. These spaces were usually elongated radially to two or three times the length of the average cells. As the season progressed the cells enlarged greatly and remained thin-walled and isodiametric. Intercellular spaces remained large and prominent in the cortex until fruit maturity. At maturity the tissue was very loosely organized.

Cells of the pith were similar to those of the cortex throughout the season, except that most of them became radially elongated by one month after bloom and remained that way until maturity. The pith was separated from the cortex by the core line, a region consisting of the ten primary vascular bundles and in the latter half of the season, of smaller, more compact cells than occurred in either the cortex or the pith.

The fleshy pericarp tissue was located on the inner side of the pith and separated from it by carpellary bundles. The tissue was made up of thin-walled isodiametric cells throughout the season. These cells were similar to those of the pith except that they were much smaller. It was from eight to twelve cell layers thick at fruit maturity.

The cartilaginous pericarp tissue occurred immediately inside the fleshy pericarp. For the first six weeks following blossom it consisted of elongated thin walled cells. By eight weeks after blossom the cells had become lignified, thick-walled, narrow-lumened, and greatly elongated. The cells were elongated in either a radial-plane, a longitudinal-axial plane, or in a plane oblique to these two. They did not increase in size after July 3, two months after blossom.

The cells of the inner epidermis, which lined the inner surface of the carpels, were immediately adjacent to and very similar in their development to those of the cartilaginous pericarp.

The extensive intercellular space system, which occurs in the Golden Delicious apple may provide a reasonable explanation for the greater amount of shrivelling in the fruit of this variety as compared to other apple varieties.

Microfilm copy of complete manuscript of 122 pages, \$1.53. Enlargements 6" x 8", 10¢ per page. Library of Congress card number MicA54-305.

**GROWTH AND DEVELOPMENT OF  
LYCOPERSICON ESCULENTUM AS  
AFFECTED BY THERMOPERIOD,  
PHOTOPERIOD, CHEMICAL GROWTH  
REGULATORS AND NUTRITIONAL SPRAYS**

(Publication No. 6853)

Edward Norman Learner, Ph.D.  
Michigan State College, 1952

The objectives of these studies were to develop economically feasible methods of improving or increasing the number of normal flowers, per cent set, and subsequent fruit quality of the first three clusters developing on tomato plants grown in Michigan greenhouses during the light deficient winter and early spring months. Adjustments of the photoperiods, thermoperiods, light intensities and the application of certain nutrient element sprays and growth regulating chemicals were utilized.

Seven week old seedlings of Early Chatham, John Baer and Rutgers varieties which were grown outdoors during the day were exposed to minimum night temperatures of 40°F., 50°F., 60°F., or 70°F. for five weeks. Significant increases in stem elongation and dry weights resulted from night temperature exposures of 60°F. whereas the most significant yield of immature fruit resulted at the 70°F. exposure.

Seven commercial selections of greenhouse forcing tomato varieties were subjected to minimum night temperatures of 60°F., 70°F., or 80°F. until "pricking-off"; 60°F. or 70°F. night exposures were employed until transplanting to the ground bed, and 60°F. for the remaining developmental periods. A daily light supplement of 16 hours of white fluorescent light of 300 f.c. intensity superimposed upon the normal light intensity and day-length was interacted at all minimum night temperatures prior to ground bed planting. Night temperature exposures of 70°F. plus the 16 hour light supplement resulted in an 18 per cent greater total weight of fruit, 30 per cent increase in total weight of No. 1 fruit, a 13.1 day earlier harvest, and 29 per cent less green placental tissue in fruit harvested.

Weekly foliar spray applications of aqueous solutions of 0.3 per cent of  $H_3PO_4$ ; 0.3 per cent  $KCl$ ; 0.75 per cent urea and 10 per cent sucrose were applied to twelve week old greenhouse grown tomato plants of ten different forcing varieties. No economic advantage resulted from successive applications of these nutrients to the leaves of the tomato plants.

Nine week old tomato plants were subjected to one of the following treatments: 40°F. or 60°F. minimum night temperatures and/or high or low moisture levels; soil applications of 0.25 mg. per plant of Maleic hydrazide, alpha-ortho-chlorophenoxy propionic acid, or 4-phthalimido-2,6-dimethyl pyrimidine; or interior of pot lightly dusted with beta-methyl Umbelliferone.



The Maleic hydrazide treatment resulted in a 45 per cent greater accumulation of total sugars in the plant roots, while alpha-ortho-chlorophenoxy propionic acid resulted in 67 per cent decrease of total sugar in the roots. Both treatments reduced the number of fruit harvested.

Total weights of fruit of the first two weeks of harvest were increased 12 per cent by 4-phthalimido-2,6-dimethyl pyrimidine.

Microfilm copy of complete manuscript of 121 pages, \$1.51. Enlargements 6" x 8", 10¢ per page. Library of Congress card number MicA54-306.

GROWTH, LEAF COMPOSITION AND  
NUTRIENT-ELEMENT BALANCE OF  
MONTMORENCY CHERRY (*Prunus cerasus*, L.)—  
EFFECT OF VARYING CONCENTRATIONS  
OF TEN NUTRIENT-ELEMENTS

(Publication 6858)

Roy Kenneth Simons, Ph.D.  
Michigan State College, 1951

One-year-old Montmorency cherry trees (*Prunus cerasus* L.) were grown in sand culture for one season to study their response to ten different nutrient-elements when one element was varied at a time while the remaining elements were kept constant.

Stock solutions of chemically pure  $\text{NH}_4\text{NO}_3$ ,  $\text{H}_3\text{PO}_4$ ,  $\text{KCl}$ ,  $\text{CaCl}_2$ ,  $\text{MgSO}_4$ ,  $\text{H}_3\text{BO}_3$ ,  $\text{MnSO}_4$ ,  $\text{CuSO}_4$ ,  $\text{ZnSO}_4$ , and  $\text{FeSO}_4$  were prepared individually for each of the nutrient-elements. From these stock solutions a dilute solution for each treatment was prepared in which the elements were combined in definite proportions.

The optimum concentration, as determined from the literature, was as follows:

Nitrogen	224.0 ppm	Manganese	5.0 ppm
Phosphorus	68.0 ppm	Boron	3.0 ppm
Potassium	86.0 ppm	Iron	2.0 ppm
Calcium	176.0 ppm	Zinc	2.0 ppm
Magnesium	58.0 ppm	Copper	2.0 ppm

Each nutrient-element was varied individually from this optimum concentration so as to provide, for each nutrient-element, levels corresponding to omitted, 1/2X, 2X, and 4X optimum.

Growth measurements were recorded for dry weight increase of tree parts and length of terminal growth. Leaf analysis for nitrogen was determined by the Kjeldahl method, and spectrographic analysis was used for the determination of P, K, Ca, Mg, Fe, Cu, B, and Mn.

The results show that maximum growth was obtained when all the nutrient-elements were at optimum concentration. Any deviations, as a shortage or an excess, from optimum concentration resulted in a significant reduction in growth without the appearance of visible symptoms of a deficiency or toxicity.

Reducing the concentration below optimum, potassium reduced growth more than did the other elements

which produced growth in the following increasing order: P, N, Ca, Fe, Mg, Mn, B, and Zn. As concentrations were increased above optimum, nitrogen reduced growth more than the other nutrient-elements which produced growth in the following increasing order: Fe, P, Ca, K, Zn, B, Mn, Cu, and Mg.

The nitrogen concentration, when varied below and above optimum, resulted in less total growth for the five levels than the other nutrient-elements. The remaining elements produced growth in the following increasing order: K, P, Ca, Fe, Cu, Mn, Zn, B, and Mg.

Leaf analysis for N, P, K, Ca, Mg, and Mn showed a positive relationship to the concentration of these nutrient-elements in the nutrient-solution.

With concentrations below optimum, there is a direct relationship between the extent of the shortage of a given nutrient-element balance for K, Mg, Fe, Cu, and Zn. However, nutrient-element balance was disturbed more at 1/2X optimum for N, P, Ca, Mn, and B, than when these nutrient-elements were omitted.

Excesses of N, P, Ca, Mg, Mn, Fe, B, and Zn disturb nutrient-element balance in proportion to the extent of the excess.

The manuscript includes a discussion of the factors involved and the relationship between concentration of the nutrient-solution and absorption of the different nutrient-elements by the plant.

Microfilm copy of complete manuscript of 131 pages, \$1.64. Enlargements 6" x 8", 10¢ per page. Library of Congress card number MicA54-307.

RELATIONSHIPS BETWEEN EASILY  
AVAILABLE CARBOHYDRATES,  
NITROGEN RECOVERY, AND GROWTH OF  
SUGAR BEETS FERTILIZED  
WITH SEVERAL GREEN MANURES

(Publication 6861)

Burleigh Carlyle Webb, Ph.D.  
Michigan State College, 1952

This investigation was designed to ascertain the assimilation of mineralized organic nitrogen by sugar beets and the influence of the relative abundance of easily available energy sources on the percentage recovery of nitrogen from green manures. The author considered the relationships between the total nitrogen and total sugars and starch content of the green manure plants.

Experimental Period I consisted of growing alfalfa, brome grass, ladino clover, orchard grass, hairy vetch and rye in sand cultures under greenhouse conditions. These plant species received three fertilizer treatments: Shive's R5S2 complete nutrient solution, Shive's R5S2 nutrient solution modified to exclude nitrogen, and tap water. Alfalfa and brome grass were grown alone and in mixture, ladino clover and orchard grass were likewise grown alone and in association as were vetch and rye. These plants were



permitted to grow for a period of ninety-eight days. At the end of the growing period all plants were harvested and dried. Compositated samples of the plants which received the designated treatments were subjected to chemical analysis for total sugars, total starch, and total nitrogen.

Results from Experimental Period I showed that the carbohydrate-nitrogen relationships within the species grown for green manures were altered by the application of combined nitrogen, or by inoculation with suitable *Rhizobium*. The carbohydrate-nitrogen relationships were regulated in part by the physiological specificity of the particular plant species.

These plants were used as green manures and furnished the sole source of materials for the nutrition of sugar beets grown in sand in Experimental Period II. Sugar beets were grown under these conditions for a period of ninety-two days. At the end of the growing period the sugar beets were harvested and analyzed for dry matter and total nitrogen content.

Results from Experiment II showed that various unit weights of nitrogen were required for each unit dry weight of beets produced. Growth response of sugar beets was contingent upon the quantity of nitrogen applied as manure, and the quantity of nitrogen recovered by the sugar beets. In order to obtain a large dry matter yield of sugar beets fertilized with green manures, it was necessary to apply large quantities of nitrogen as manure. A high percentage recovery of the added nitrogen was also necessary. The starch and sugar contents of the various green manures, or the existing ratios of carbohydrate (composed of sugars and starch) and nitrogen did not under the conditions of this investigation determine the manurial efficiency of the several green manures.

Microfilm copy of complete manuscript of 96 pages, \$1.20. Enlargements 6" x 8", 10¢ per page. Library of Congress card number MicA54-308.

## ANATOMY

### THE MUSCULAR ARCHITECTURE OF THE VENTRICLES AND ATRIA OF HOG AND DOG HEARTS

(Publication No. 7028)

Carolyn June Eyster, Ph.D.  
Northwestern University, 1953

The present work describes the muscular architecture of the ventricles and atria of hog and dog hearts. Numerous hearts of each animal were dissected. The hearts were prepared for dissection by either one of two methods: First, some of the hearts were simmered for about twenty-five minutes in a three per cent aqueous solution of acetic acid and then were preserved by simple refrigeration. Second, other hearts were allowed to remain in a nitric acid-water-glycerine solution for three or four days and then preserved in five per cent formalin. The hearts were dissected grossly or with the aid of a dissecting microscope.

A. The Ventricles. In general one is able to conclude that the muscular architecture of hog and dog ventricles is arranged in a very orderly manner which is consistently and accurately repeated in the ventricles of all normal hogs and dogs. Although differences do exist between the muscular architecture of hog and of dog ventricles, these differences are quantitative rather than qualitative. Consequently, one is justified in drawing the following five fundamental generalizations which apply to both hog and dog ventricles:

1. Every muscle fascicle in the ventricles both originates from and inserts into the fibrous skeleton at the base of the heart ventricles.

2. The ventricles as a whole are enveloped or nearly enveloped in a thin superficial stratum of fascicles which penetrates the apex of the left ventricle.

3. Beneath this superficial stratum of fascicles is a second thicker stratum. At the apex of the left ventricle the majority of the fascicles of this second layer join the fascicles of the more superficial stratum, penetrate the apex of the left ventricular cavity, loop upward onto the internal surface of the left ventricular cavity, and finally insert into the base of the left ventricle. Some of the fascicles of this second layer contribute to the muscular interventricular septum.

4. Between the outer descending and the inner ascending arms of the fascicles just described is a cylinder of fascicles encompassing only the left ventricular cavity.

5. The deepest fascicles of the right ventricle originate from the base of the right ventricle and in figure-of-eight fashion encompass the right ventricular cavity, pass forward through the interventricular septum, and finally penetrate the apex of the left ventricle to join the other fascicles which penetrate at this point.

B. The Atria. In general there are no major fundamental differences in the muscular architecture of hog and dog atria. The differences that do exist are quantitative rather than qualitative. In the original article one can find detailed descriptions of the exact courses of numerous individual fascicle tracts. However, these exact courses are not of primary importance. Rather the general concepts, applicable to both hog and dog atria, as listed below are the important concepts.

1. Practically every fascicle in the atria begins and ends in one of the fibrous atrio-ventricular rings. The exceptions are fascicles which originate from an atrio-ventricular ring but which terminate merely by dwindling out on the walls of the great veins of the heart.

2. Some of the fascicles are interatrial fascicles, common to both atria; whereas the other fascicles are intratrial fascicles, confined entirely to one or the other atrium.

3. The interatrial fascicles contribute mostly to the inferior portions of the atria; whereas the intratrial fascicles contribute mostly to the pectinate and auricular portions of the atria.

4. In general there are two layers of fascicles: an outer horizontal layer and an inner vertical layer.

5. The inner and the outer layers are continuous with one another.

6. The atria present a complex picture with much intertwining of the fascicles.

Microfilm copy of complete manuscript of 266 pages, \$3.33. Enlargements 6" x 8", 10¢ per page. Library of Congress card number MicA54-309.

## ANTHROPOLOGY

### THE PAKOT (SUK) OF KENYA WITH SPECIAL REFERENCE TO THE ROLE OF LIVESTOCK IN THEIR SUBSISTENCE ECONOMY

(Publication No. 7064)

Harold Kenneth Schneider, Ph.D.  
Northwestern University, 1953

The chief objective is to demonstrate by the use of detailed ethnographic data and census figures of stock and population that the Pakot use stock in their subsistence economy beyond the consumption of milk and the eating of meat when stock die or are slaughtered for ritual purposes. This is contrary to the widely accepted position of other students of the Pakot and other so-called Nilo-Hamitic and Nilotic peoples of East Africa.

Because previous ethnographic information on the Pakot is scanty, data gathered in Kenya in 1951-52 on the political, social, religious, aesthetic and technological life of the Pakot are included. There are also discussions of Pakot distribution and intra-tribal divisions, physical environment, racial and

linguistic relationships, prehistory and the history of contact with the British. The emphasis of the study is on the economic life of the Pakot: the production of subsistence and other goods; economic institutions and economic processes such as division of labor, trade, ceremonial exchange, value and wealth, food consumption and investment; and the place of cattle, sheep and goats in the economy.

It was concluded that among Pakot stock are important in the subsistence economy and that their use and value differ depending upon the type and sex of stock, e.g., cattle as opposed to sheep, and steers as opposed to cows. Cattle are traded for other stock and for grain, are sold for money and are slaughtered for food on non-ritual occasions. Meat is an important part of the basic diet of the people, and although stock cannot be considered to be money, they are used in exchange and some stock may be considered as capital goods.

Microfilm copy of complete manuscript of 381 pages, \$4.76. Enlargements 6" x 8", 10¢ per page. Library of Congress card number MicA54-310.

## ASTRONOMY

### A STUDY OF THE ATMOSPHERES OF EARLY O AND OF STARS

(Publication No. 6826)

John Beverley Oke, Ph.D.  
Princeton University, 1953

Spectrograms, having a dispersion of 10.2 Å/mm and covering the range from 3300 to 4900 Å, have been obtained for eight early O and Of stars. Equivalent

widths of nearly all absorption lines have been measured and are listed in Table 2a and 2b.

The equivalent widths have been analysed and it is found that the atmospheres can be described best by the data of Table 8. The very small effective gravity  $g_g$ , as measured by the gas pressure, is a result primarily of the large radiation pressure which nearly counterbalances gravity. Approximate values are obtained for the mass, luminosity, and radius of an Of star (listed in equation (11)) which



are in fairly good agreement with the observational evidence. The small value of  $\log n_e$  in Table 8 does leave, however, a discrepancy in the breadths of the weaker hydrogen and helium lines, in the sense that the observed lines are too wide.

The emission lines of NIII at  $\lambda 4634$  and  $\lambda 4640$  and the HeII line at  $\lambda 4686$  have also been studied. Typical profiles are shown in Figure 5. It is shown that the emission line intensities are almost certainly varying in a few hours in the two stars for which adequate data are available. The proposal is made that the emission lines arise in the upper atmospheres of the stars rather than in an extended shell. Three

circumstances suggest this: (1) The profiles of the emission and absorption lines are very similar in shape and breadth. (2) In one star which is rotating, the emission lines show roughly the same rotational velocity as the absorption lines. (3) The ratio of the emission equivalent widths of  $\lambda 4640$  and  $\lambda 4634$  indicate considerable self-absorption which would not be expected for a dilution factor much less than unity.

Microfilm copy of complete manuscript of 62 pages, \$1.00. Enlargements 6" x 8", 10¢ per page. Library of Congress card number MicA54-311.

## BACTERIOLOGY

### THE PRODUCTION OF NONINFECTIOUS VIRAL COMPONENTS IN BACTERIA INFECTED WITH BACTERIOPHAGE

(Publication No. 6935)

Robert Ivan DeMars, Ph.D.  
University of Illinois, 1953

Two types of noninfectious, bacteriophage-specific materials have been studied. Phage-free fractions of lysates of T2, T4, T5 and T6 obtained by ultrafiltration contain materials ("ultrafiltrable factors") that can combine specifically with phage-neutralizing antibody. The antibody-combining power has been used to titrate these phage-specific materials. Experiments with premature lysis of T2-infected cells revealed that the noninfectious, antibody-combining materials appear before infectious intracellular viruses do. Evidence is presented which indicates that these materials are related to the phage tail.

Cells infected with T2 in the presence of proflavine fail to liberate appreciable amounts of active phage upon lysis. They produce a variety of phage-specific materials, including all the phage constituents that have been identified thus far: phage DNA, tail-related materials with affinity for neutralizing antibody and particles apparently identical with head skins. The latter particles or "doughnuts" have been partially purified and characterized serologically, isotopically and microscopically.

The relation of these materials to the mature phage particles and to their native precursor stages is discussed.

Microfilm copy of complete manuscript of 85 pages, \$1.06. Enlargements 6" x 8", 10¢ per page. Library of Congress card number MicA54-312.

### OXYGEN TENSION AS A POSSIBLE FACTOR IN THE VIRULENCE OF THE TUBERCLE BACILLUS

(Publication No. 6895)

L. Ruth Guy, Ph.D.  
Stanford University, 1953

Comparisons were made of growth in cultures of tubercle bacilli cultivated in air and under low oxygen tensions. Four avirulent variants, an attenuated strain, and ten virulent strains, including five cultures freshly isolated from tuberculous patients, were employed in this study. Quantitative determinations of the amounts of growth produced in these cultures were made by means of optical density readings and dry weights.

Although the multiplication of all strains of *Mycobacterium tuberculosis* was inhibited in an oxygen tension comparable to that of animal tissues, the avirulent strains were suppressed significantly more than the disease producing strains. B.C.G., the attenuated strain, resembled the virulent organisms more than the non-pathogenic bacteria in this respect.

From these findings it is possible to conclude that the oxygen tension of the environment may be a determining factor in the virulence of the tubercle bacillus. If organisms are unable to multiply in the gaseous tensions provided by the host, they can not produce disease. On the other hand, an attenuated strain can reproduce rapidly enough in this gaseous environment to initiate disease, but its propagation in the tissues is interrupted by some acquired property of the host, perhaps acquired immunity.

Microfilm copy of complete manuscript of 113 pages, \$1.41. Enlargements 6" x 8", 10¢ per page. Library of Congress card number MicA54-313.



The results obtained seem to indicate that under the conditions of this test the electrode potential changes with time in a manner similar to the logarithm of the number of surviving organisms. The slope of the reoxidation curve was found to be a function of the quaternary concentration. Of the six quaternary inactivators studied, one was able to

partially reverse germicidal action, two were able to arrest this action at the time the inhibitor was added, and three were found to be lacking in neutralizing properties.

Microfilm copy of complete manuscript of 95 pages, \$1.19. Enlargements 6" x 8", 10¢ per page. Library of Congress card number MicA54-315.

#### THE ISOLATION OF INTERMEDIATES IN THE KREBS CITRIC ACID CYCLE IN CHEESE AND FERMENTED MILKS

(Publication No. 7002)

Clemence John Honer, Ph.D.  
University of Illinois, 1953

Cheddar cheese ripening involves various chemical reactions, bacterial metabolism and enzymatic changes which singly or combined promote the fine delicate flavors associated with the cured cheese. The specific compounds concerned with the desired body, texture and flavor characteristics of the cheese as well as the intermediates possibly involved in the synthesis of these constituents are unknown.

Krebs citric acid cycle as it occurs in some bacterial and muscular metabolism has not been reported as a mechanism in cheese ripening. If the Krebs intermediates were to be demonstrated in cheese ripening, additional information regarding the formation of cheese flavors and the technology of cheese ripening would be obtained. A study, therefore, was undertaken to determine whether the Krebs citric acid cycle was a mechanism involved in Cheddar cheese ripening and *Streptococcus lactis* type starter.

The methods used in this study embraced silica gel chromatography and paper partition chromatography.

Three lots of Cheddar cheese were made and analyzed at various stages of ripening. Lot A was a normal product having the desired cheese characteristics; lot B was a high acid cheese which demonstrated all the defects associated with high acid; and lot C was a mild acid cheese in which the acid flavor was less pronounced. *Streptococcus lactis* type starter culture was prepared and analyzed for butyric, propionic, acetic, pyruvic, formic, fumaric, glutaric,  $\alpha$  ketoglutaric, lactic, succinic, aconitic, malic, citric, and iso citric acids.

Acetate was the only Krebs intermediate found in Cheddar cheese during the entire ripening period studied and in the *Streptococcus lactis* type starter culture. Citrate was detected twice in lot A, once in the curd and in the cheese after seven days of aging. Malate appeared only once in lot A and this was at the age of seven days. Citrate and malate were not found in lots B and C at any time. Fumarate, pyruvate, succinate, and ketoglutarate were not detected in any of the cheese or starter cultures analyzed.

The acetate levels in the three lots of cheese demonstrated a definite cycle in which the concentration increased, decreased, increased, and decreased during

the study period. The time interval involved in these cycles was from 30 to 90 days. The acid cheese, lot B, showed a lower acetate concentration throughout the cyclic trends than lot A or C.

A cyclic trend in the lactate level in all three lots was also observed. Lot B in this case demonstrated higher amounts of lactate than the other two lots.

Formate was detected in all three lots of cheese during the entire ripening period studied. This constituent was also found in the *Streptococcus lactis* type starter culture.

Traces of butyrate appeared in lot A after 308 days of aging. Propionate was not observed at any time.

The possible role of acetate functioning as an important intermediate between fat or protein degraded fragments and typical Cheddar cheese flavor compounds is discussed. The observed cycle in the trends of acetate and lactate levels are considered and discussed as related to other changes occurring in cheese ripening.

It was concluded on the basis of the sensitivity of the methods employed that the mechanisms involved in the Krebs citric acid cycle did not function during the ripening of Cheddar cheese nor during the fermentation process of *Streptococcus lactis* type starter culture.

Microfilm copy of complete manuscript of 70 pages, \$1.00. Enlargements 6" x 8", 10¢ per page. Library of Congress card number MicA54-316.

#### THE D-AMINO ACID CONTENT OF BACTERIAL SPORES AND VEGETATIVE CELLS

(Publication No. 6958)

Norman Lionel Lawrence, Ph.D.  
University of Illinois, 1953

The high alanine racemase activity of spores of *Bacillus terminalis* as compared to the vegetative cells led us to think that the spores and vegetative cells might differ significantly in their content of D-amino acids.

This was investigated using acid hydrolysates of washed and dried spores and vegetative cells. Approximately 80% of the Kjeldahl nitrogen of the dried cells was recovered in the hydrolysates, and about 90% of this was accounted for as amino nitrogen by decarboxylation with Chloramine-T.

The D-amino nitrogen in the hydrolysates was estimated by the use of D-amino acid oxidase obtained from pig kidney. It was found that the vegetative cells contained approximately 3% of their amino nitrogen in the D-form, while only about 1% D-nitrogen was present in the spore hydrolysates.

The neutral, dicarboxylic and diamino acids of the hydrolysates were separated by electrophoresis on a starch column. The distribution of the D-amino acids in the hydrolysates was estimated by measuring the ratio of D- to L-amino nitrogen in each fraction. It was found that the D-amino nitrogen was distributed



equally between the neutral and basic fractions of each hydrolysate.

The ratio of D- to L-glutamic acid in the hydrolysates was estimated by the microbiological procedure of Dunn, Camien, Shankman and Block. It appeared that this ratio was larger in vegetative cells than in spores.

The presence of dipicolinic acid in exudates of germinated spores was confirmed.

Microfilm copy of complete manuscript of 40 pages, \$1.00. Enlargements 6" x 8", 10¢ per page. Library of Congress card number MicA54-317.

#### STUDIES ON THE NATURE AND BIOLOGICAL ACTIVITY OF A FRACTION OF BOVINE SERUM RESPONSIBLE FOR THE STIMULATION OF GROWTH OF MYCOBACTERIA

(Publication No. 7052)

Tom Joseph McBride, Ph.D.  
Northwestern University, 1953

The findings of several investigators have indicated that the growth of tubercle bacilli is stimulated in the presence of serum. It has also been reported that the plasma pseudoglobulin proantithrombin is able to stimulate the growth of the H37Rv strain of *Mycobacterium tuberculosis* var. *hominis* to the same extent as does bovine serum. The present study was undertaken with the following objectives in mind: the confirmation of previous reports on the effect of bovine serum and proantithrombin on the growth rate of tubercle bacilli; attempts at the isolation or concentration of the growth stimulating principle of proantithrombin; and determination of the chemical nature and some of the biological properties of the active fraction.

The incorporation of bovine serum or the plasma pseudoglobulin proantithrombin into a modified Proskauer and Beck synthetic medium was found to produce marked stimulation of the growth of the H37Rv strain of *M. tuberculosis* var. *hominis* as determined by a technique permitting the measurement of the growth rate of this organism.

Peptic hydrolysates of proantithrombin were also found to be active but tryptic hydrolysates were devoid of activity. During the course of attempts to isolate or concentrate a fully active fraction from the peptic hydrolysate of the protein it was found that the growth promoting fraction was not soluble in ether, that it was largely insoluble in ethyl alcohol, that it was not adsorbed by charcoal, and that it was not dialyzable. Positive tests for carbohydrate could not be obtained. The failure to demonstrate the presence of carbohydrate, the lack of lipid characteristics in the active fractions, and the ability of trypsin to destroy the growth stimulating effect led to the belief that the activity was resident in, or closely associated with, a polypeptide.

The growth promoting fraction in proantithrombin

hydrolysates was found to be stable to temperatures up to 100° C., applied for a period of 30 minutes, and to autoclaving for 15 minutes at 15 pounds pressure when incorporated into the synthetic medium. However, some loss of activity occurred on evaporation to dryness at a temperature of 50° C. applied for 48 hours. The hydrolysate was found to retain its growth promoting ability for at least 3 months during storage at pH 7.0 in the refrigerator at approximately 10° C. Hydrolysates of proantithrombin suffered no loss of growth promoting ability if stored at a pH of 1.7 or 8.5 for at least 72 hours at 37° C.

It was found possible to decrease the least amount of active material able to provide maximum stimulation from 0.125 per cent to 0.002 per cent by charcoal adsorption and alcohol fractionation, and from 0.125 per cent to 0.003 per cent by charcoal adsorption and dialysis. Both processes were carried out on peptic hydrolysates of the protein.

Four other proteins tested did not produce the stimulation of growth observed with proantithrombin.

Both proantithrombin and its hydrolysate increased the oxygen uptake of the H37Rv strain but had no effect on the oxygen uptake of the H37Ra strain. These findings parallel those of the growth studies.

These findings lead to the conclusion that there is a growth promoting fraction in the plasma pseudoglobulin proantithrombin which exhibits properties characteristic of a polypeptide. A polypeptide with similar biological activity was not present in four other proteins tested. The growth promoting effect of the proantithrombin polypeptide was evident with only one of four other strains of *M. tuberculosis* var. *hominis* and with the single strain of *M. tuberculosis* var. *bovis* tested. Over the range of concentrations tested, proantithrombin did not stimulate the growth of some other bacteria whose growth was enhanced in the presence of bovine serum. Therefore, it must be concluded that the stimulation of the growth rate of these organisms depends on the presence in serum of substances other than proantithrombin.

Microfilm copy of complete manuscript of 154 pages, \$1.93. Enlargements 6" x 8", 10¢ per page. Library of Congress card number MicA54-318.

#### NUTRITION AND METABOLISM OF *CLOSTRIDIUM TETANOMORPHUM*

(Publication No. 6906)

James Hiroto Nakano, Ph.D.  
Stanford University, 1953

The growth requirements and general metabolic characteristics of strain E-42, believed to be a strain of *C. cochlearium*, were determined. During the course of this study it became evident that E-42 is a strain of the closely related species, *C. tetanomorphum*. These two species differ primarily in the ability of the latter to ferment glucose and maltose.

E-42 grows luxuriously in commercially available media such as Bacto-Brewer-Thioglycollate Broth



or Bacto-Nutrient Broth enriched with glucose and maintained in a reduced state with sodium thioglycollate. It is exacting in its nutritional requirements in that no growth was observed in a basal salt-glucose-thioglycollate medium lacking pantothenic and nicotinic acids, biotin, l-tryptophan, and l-glutamic acid. Para-aminobenzoic acid, choline, thiamin, l-leucine, l-tyrosine, and dl-phenylalanine may exert slight growth promoting activity but are not essential for growth.

The non-gaseous end products produced by E-42 grown in 1 per cent glucose nutrient broth were acetic and butyric acids, and a small amount of lactic acid. It was noted that about 50 per cent of the glucose contained in the medium was utilized during the 48 hours of incubation.

The end products of E-42 grown in a basal salt solution containing 0.5 per cent casein hydrolysate, 0.5 per cent yeast extract, and 1.0 per cent glucose were found to be principally carbon dioxide, acetic and butyric acids and a small amount of lactic acid. (No hydrogen determination was included in these studies.)

The main end products of glucose fermentation by washed cell suspensions of E-42 were butyric and acetic acids and relatively small amounts of gas. No detectable amounts of ethyl alcohol or formic acid were found.

Washed cell suspensions of E-42 were found to dissimilate pyruvate with the production of carbon dioxide, hydrogen, acetic, butyric, and lactic acids. l-(+)-Glutamic acid was dissimilated with the production of carbon dioxide, hydrogen, acetic and butyric acids, and ammonia. Tentative balance sheets are presented for the pyruvate and l-(+)-glutamic acid fermentations.

E-42 can be classified as an "acid-producer" on the basis of the type of glucose dissimilation induced by it. Butyric and acetic acids together with small amounts of lactic acid, carbon dioxide, and hydrogen are the main end products of the fermentation of glucose or pyruvate by this *Clostridium*, whereas C<sub>2</sub> to C<sub>4</sub> alcohols are produced under similar conditions by clostridia which may be classified as "alcohol-producers."

Microfilm copy of complete manuscript of 81 pages, \$1.00. Enlargements 6" x 8", 10¢ per page. Library of Congress card number MicA54-319.

#### STUDIES ON THE SULFUR NUTRITION OF *LACTOBACILLUS ARABINOSUS*

(Publication No. 6982)

Tetsuo Shiota, Ph.D.  
University of Illinois, 1953

This investigation was carried out to determine: (1) the ability of various sulfur compounds to serve as sulfur sources, and (2) the probable mechanisms involved in the utilization of sulfur compounds by *Lactobacillus arabinosus* 17-5. Using a synthetic medium, the growth of *L. arabinosus* in the presence

of methionine as a sole sulfur source was considered as 100 per cent. Replacing methionine with other sulfur compounds gave the following relative growth response: alpha-hydroxy analogue (gamma-methio-alpha-hydroxybutyric acid) 91 per cent; cysteine, 71 per cent; cystathionine, 35 per cent; homocysteine, 21 per cent; homocystine, 13 per cent. Increasing the concentration of the latter four compounds increased the amount of growth obtained. Sulfide, sulfate, and thioglycollate supported no growth. Methionine content of hydrolyzed, homocysteine grown cells was 1.27 per cent, cysteine grown cells, 1.47 per cent, and methionine grown cells, 1.75 per cent, indicating a synthesis of methionine from the first two mentioned compounds.

Results of experiments concerning the effect of vitamins on the utilization of sulfur compounds indicated that when methionine or its alpha-hydroxy analogue was supplied as a sole sulfur source, p-aminobenzoic acid was not required for growth. When cysteine, homocysteine, or cystathionine was supplied, p-aminobenzoic acid was required. Inhibition studies using sulfanilamide confirmed the above results. The growth of *L. arabinosus* was inhibited by sulfanilamide at a concentration of 2000 ug./ml., when cysteine or homocysteine was supplied as a sole sulfur source. Using methionine, the growth was not inhibited by sulfanilamide up to 3000 ug./ml.

Possible methyl sources such as sodium bicarbonate, sodium formate, choline, betaine, and sarcosine did not increase the growth response of *L. arabinosus* to homocyst(e)ine.

Studies on the effect of amino acids on the utilization of sulfur compounds demonstrated that serine was required for growth when methionine, its alpha-hydroxy analogue, or homocysteine was supplied. Cysteine or cystathionine, however, eliminated the serine requirement of *L. arabinosus*. Sodium pyruvate partially replaced this requirement for serine in the presence of methionine. Serine content of cells grown on cysteine was 2.9 per cent; on cysteine without serine, 2.0 per cent; and on methionine, 2.0 per cent.

Resting and dried cells of *L. arabinosus* grown on AC broth or H<sub>2</sub>O<sub>2</sub> treated peptone medium, supplemented with homocysteine, were tested for their ability to synthesize amino acids under different conditions at 37° C. over a period of 24 hours. Tests were run by suspending the cells in phosphate buffer with the following additions: (1) homocysteine; homocysteine plus serine, betaine, choline, or sarcosine singly, (2) cysteine; cysteine plus homoserine. Even in conjunction with vitamin B<sub>12</sub>, p-aminobenzoic acid, and a vitamin mixture, the above failed to synthesize any amino acids (homocysteine, cystathionine, or methionine).

Resting and dried cells grown on cysteine also did not synthesize amino acids in a similar system as mentioned above with the addition of adenosine triphosphate, pyridoxal, or pyridoxal phosphate. Resting cell suspensions of *L. arabinosus* grown on cysteine failed to attack cystathionine alone or in the presence of p-aminobenzoic acid and pyridoxal. Dried cells, however, were capable of attacking

cystathionine with the formation of homocysteine, pyruvate,  $\text{NH}_3$ ,  $\text{H}_2\text{S}$  and methionine. These cells also possessed cysteine and homocysteine desulfhydrase and serine dehydrase. Resting and dried cell suspensions grown on gamma-methio-alpha-hydroxybutyric acid synthesized methionine from this compound.

Microfilm copy of complete manuscript of 78 pages, \$1.00. Enlargements 6" x 8", 10¢ per page. Library of Congress card number MicA54-320.

**STUDIES ON THE RELATIONSHIP BETWEEN  
EQUILIBRIUM VAPOR PRESSURE AND  
MOISTURE CONTENT OF  
BACTERIAL ENDOSPORES**

(Publication No. 6995)

Donald George Waldhalm, Ph.D.  
University of Illinois, 1953

It has been suggested that the low activity of water (bound water) in spores is responsible for their heat resistance. The present study was undertaken for the purpose of studying the activity of moisture (as evidenced by vapor pressure) in the spores and vegetative cells of a member of the genus *Bacillus*. An additional study was performed which illustrates the hygroscopic nature of spores and vegetative cells.

Vapor pressures were measured by a manometric method and, independently, with an electric hygrometer. Moisture contents were determined by oven drying at  $110^\circ\text{C}$ ., since a study of the temperature vs. weight-loss relationship indicates that this temperature gave reliable results for these materials.

No difference in the vapor pressures was observed for spores and vegetative cells having less than 0.2 Gm Water/Gm Dry Solids. Above this value, the vapor pressure exhibited by the spores increased more rapidly reaching the vapor pressure of pure water at approximately 0.4 Gm Water /Gm Dry Solids. Vegetative cells reached this vapor pressure at approximately 2.3 Gm Water /Gm Dry Solids. It was observed that vegetative cells are more strongly hygroscopic than spores in this range of moisture contents. These results show that in the range of moisture contents from 0.2 Gm Water/Gm Dry Solids to 2.3 Gm Water/Gm Dry Solids spores have less bound water (higher moisture activity) than vegetative cells.

Microfilm copy of complete manuscript of 40 pages, \$1.00. Enlargements 6" x 8", 10¢ per page. Library of Congress card number MicA54-321.

**OXIDATIVE CARBON ASSIMILATION  
BY *BACILLUS SUBTILIS***

(Publication No. 6914)

Burton Irwin Wilner, Ph.D.  
Stanford University, 1953

Measurements, using the Warburg technique, of oxygen uptake by cells of *Bacillus subtilis* in the presence of various concentrations of glucose, succinate, fumarate, and pyruvate produced values which ranged from less than 100 per cent of the amounts required for complete oxidation of the substrates to percentages of over 200. When the observed values were corrected for the endogenous respiration, the fractional oxygen uptake did not vary with the concentration of substrate and amounted to 56 per cent for glucose, 63 per cent for succinate, 48 per cent for fumarate, and 43 per cent for pyruvate. The constancy of these corrected values at different substrate concentrations is highly suggestive evidence that endogenous respiration of washed cells of *B. subtilis* continues unaltered in the presence of an external foodstuff. On the basis of evidence obtained by other investigators with various organisms, the assumption was made that the portions of the four substrates not accounted for by oxygen uptake were oxidatively assimilated by the cells. Lactate and acetate did not appear to be utilized at an appreciable rate by this organism. From the results of further manometric experiments in which both carbon dioxide and oxygen exchanges were measured equations expressing the basic assimilatory reactions were developed.

Comparisons of the free energy available on complete oxidation to carbon dioxide and water of molar quantities of the four substrates with the extents of oxidative assimilation of the carbon compounds by the washed cells demonstrated no close relationship between the two factors. This fact suggests that the chemical structure of the substrate and its ability to supply building materials to the cell may be a more valid criterion for predicting the extent of assimilation of the foodstuff and for evaluating its contribution to the economy of the cell than the free energy basis.

In order to determine the validity of the assumption that the portions of the substrates not accounted for by oxygen uptake in the manometric experiments were actually assimilated, determinations were made of the actual increase in carbon content of washed cells respiring in a buffered glucose solution. Carbon dioxide produced by the cells during the period of exposure was also measured, in addition to carbon dioxide production by an endogenous blank. The value for  $\text{CO}_2$ -carbon corrected for endogenous respiration is a measure of the amount of glucose oxidized by the cells, while the increase in cell carbon is a measure of the quantity of substrate oxidatively assimilated. Together the two values represent the total amount of glucose carbon consumed by the cells. The average value for increase in cell carbon was found to amount to 48 per cent of the figure for total carbon consumption; that is to say, of the glucose carbon consumed by the cells, 52 per cent was oxidized



and 48 per cent was actually oxidatively assimilated by the cells. The results of these direct experiments appear to validate the percentages of assimilation assumed from the manometric experiments and proposed by the assimilatory equations for glucose, and by implication for all four substrates examined.

Oxidative assimilation by growing cultures of *B. subtilis* in the presence of glucose was determined at two hour intervals over a six hour period. The results of these experiments suggested that the extent of substrate carbon assimilation parallels the changes in phase of growth of the culture and may be used to follow the growth of proliferating cells.

Microfilm copy of complete manuscript of 111 pages, \$1.39. Enlargements 6" x 8", 10¢ per page. Library of Congress card number MicA54-322.

THE FATE OF INOSITOL AS AN  
ESSENTIAL METABOLITE FOR  
SCHIZOSACCHAROMYCES POMBE

(Publication No. 7001)

Henry Floyd Yarbrough, Jr., Ph.D.  
University of Illinois, 1953

Introduction

Interest in inositol as a growth factor for yeasts was stimulated by Eastcott when she found m-inositol to be one of the fractions of "Bios." Since that time yeasts have been extensively investigated in regard to their requirements for this compound. To date only the meso- or optically-inactive form has been found to give growth response with yeasts. The other widely distributed isomers of inositol and complexes of inositol have not been used by the yeasts studied.

Free as well as combined m-inositol have been found in almost all animal and plant tissues. The compound has also been reported to be present in the phosphatides of tubercle bacilli and at least one author has reported the existence of a phytin-like compound in yeast.

In this work a yeast, *Schizosaccharomyces pombe*, was used because it has an absolute requirement for m-inositol; i.e., no measurable growth occurs in the absence of m-inositol. A determination of growth and inositol uptake was made. Following this, an attempt

was made to determine the distribution of inositol and inositol compounds in the yeast cell and the surrounding medium.

Results

In preliminary experiments, it was found that fed inositol disappears from the medium at a rate commensurate with the growth rate of the organism. During the stationary phase of growth a form of inositol is found in the supernatant which is unavailable to the yeast as a substitute for m-inositol until the supernatant is hydrolyzed. This form presumably arises as a direct or indirect result of cell autolysis. However, it differs from the greater portion of the cellular inositol in that it is insoluble in the fat solvents used in these experiments.

Recovery of the fed inositol from the cells and supernatant medium ranges from 85-100%. The cells usually contain 65-75% and the supernatant 25-35% — almost all of which is unavailable to the yeasts unless the compounds are hydrolyzed. This recovery of fed inositol indicates that the compound is not broken down by the cell but is used as an intact molecule.

Much of the combined inositol contained in the yeast cell is soluble in fat solvents. This lipid-inositol appears to be primarily in the form of lecithin-like compounds. Little or no cephalin-like compounds were demonstrated in this yeast. Combined inositol which is not soluble in the fat solvents used is not liberated by incubation with proteolytic enzymes. Cells undergoing autolysis liberate free inositol from cellular inositol compounds. None of these cellular forms of inositol are available to the intact cells until they are hydrolyzed or autolyzed.

The nucleoproteins of this yeast were found to contain little inositol either before or after extraction with fat solvents. A small amount of inositol was found in the water soluble protein fraction. However, this material was removed by the fat solvents used. The cell residues after exhaustive extraction with solvents and nucleoprotein separation still contain 15-20% of the original cell content of inositol.

The yeast contains no measurable amount of phytin-like compounds as determined in our laboratory by the method of Averill and King.

Microfilm copy of complete manuscript of 77 pages, \$1.00. Enlargements 6" x 8", 10¢ per page. Library of Congress card number MicA54-323.



## BIOLOGY - GENETICS

### BIOLOGY - GENETICS

#### ON THE BEHAVIOR TOWARD HUMIDITY OF DROSOPHILA PSEUDOOBSCURA AND DROSOPHILA PERSIMILIS

(Publication No. 6792)

Donald Day Boyer, Ph.D.  
Princeton University, 1953

A knowledge of the physiological differences between two closely related species is necessary to understand the mechanisms by which stable populations of both species are maintained in parts of their ranges where they overlap.

The distributions of Drosophila pseudoobscura and Drosophila persimilis, whose ranges overlap extensively in the western United States, are correlated more precisely with differences in relative humidity than with other physical variables.

These two species are here examined in detail regarding their behavior to differences in humidity as tested in the laboratory by means of choice chambers wherein are offered pairs of atmospheres differing in relative humidity. The advantages and limitations of the choice chamber technique are discussed. All experiments have been performed at  $17 \pm 1^{\circ}$  C., using well-fed undesiccated animals.

The influence of a number of factors on the humidity response is studied especially in Drosophila pseudoobscura. In general, more intense responses are achieved by males than females, and by adult animals over one week old than by 2-day old animals. Using animals conditioned to diurnal alternations of light and dark, slight differences in reaction are noted at different times of day.

All animals used respond strikingly to mechanical agitation by moving into the drier of any pair of humidities offered, even when undisturbed animals in the same circumstances show a strong preference for the moister atmosphere.

One-week old males of both species were used to determine the reactions in darkness to equal humidity differences throughout the range. D. persimilis responds with about equal intensity throughout the range, preferring the drier of any two humidities offered; this indicates a preferred humidity less than 20% R.H. D. pseudoobscura prefers the wetter of any pair except near saturation, showing a most intense wet response when 60% is the higher humidity offered; when offered choices near saturation, the drier alternative is chosen, indicating a preferred humidity between 70 and 90% R.H.

These results are in flat contradiction to ecological findings, where D. persimilis prefers a more humid environment than D. pseudoobscura; and cannot be indicative of the responses to humidity of these species under natural conditions.

It is quite significant that light radically modifies

the response to humidity, in some cases actually reversing the preference. In all choices offered, light of increasing intensity shifts the reaction of D. persimilis toward wetness, that of D. pseudoobscura toward dryness. While in many of these experiments this shift is equivalent to a reduction in intensity of a preference, the effect of light cannot be merely to diminish a response because in some cases light reverses the choice, and in other cases preferences are more extreme in light than in dark.

While desiccated flies were not employed in this study, it is important to note that wild-collected specimens do not appear to be well-fed, and cannot be assumed to be in a condition of optimal water balance; further, it is known that desiccation can easily shift the humidity responses from dry to wet. It is suggested that further studies on the effect of light and desiccation on the response to humidity may well bring into accord the ecological and laboratory findings.

Microfilm copy of complete manuscript of 120 pages, \$1.50. Enlargements 6" x 8", 10¢ per page. Library of Congress card number MicA54-324.

#### THE HYDROBIOLOGY OF THE ALVISO SALT PONDS

(Publication No. 6890)

Lars Hjalmar Carpelan, Ph.D.  
Stanford University, 1953

Ponds used for salt production along the shores of San Francisco Bay provide an extreme environment for organisms. Environmental factors and organisms present were studied in a series of five ponds, consisting of about 4000 acres near Alviso. Productivity and standing crop of algae were estimated.

Rains, averaging 10.24 inches annually, dilute the ponds in winter. During a rainless summer, water temperatures maintain a tropical mean of  $23^{\circ}$  C., which is high for the latitude ( $37^{\circ} 30'$  N.). The extreme annual range is from  $8^{\circ}$  C. in January to  $33^{\circ}$  C. in August. The diurnal range is also great, being  $12^{\circ}$  C. in summer when insolation is greatest.

Bay water evaporates as it flows through a series in which salinity increases in each successive pond. Mean annual salinity, in parts per thousand, is 27.5 in the first pond, 33.5 in the second, 47 in the third, 70.5 in the fourth, and 93.5 in the fifth. There is a wide seasonal range within each pond.

pH approximates the sea water range ( $8.0 \pm 0.3$ ) in winter; but pH is affected by photosynthesis and by salinity. Mean summer values in ponds No. 1 and No. 2 are pH 9.1 (A.M.) and 9.5 (P.M.). The diurnal rise is due to assimilation of  $\text{CO}_2$  by algae. The pH

remains high at night due to supersaturation of carbonate. At higher salinities (beyond 80 parts per thousand) carbonate is precipitated. The pH is lower, and nearly constant (8.1 - 8.2), year-round in pond No. 5, and during autumn in pond No. 4.

Dissolved oxygen is depleted at night due to the respiration of numerous organisms; but oxygen evolved by photosynthesis supersaturates the water by noon, except in limited areas which are continuously anaerobic during decomposition of accumulated macroscopic algae.

Concentrations of ammonia and inorganic phosphate in the bay water are higher than in the ocean, but nitrate is within the range reported for the sea. These plant nutrients enter a cycle within the ponds; they are assimilated by algae and rendered available again by bacteria.

Green algae are the principal plants. *Enteromorpha* sp. and *Rhizoclonium* sp. are dominant in the first two ponds in summer. They alternate with *Stichococcus* sp., which is abundant only in spring in these brackish ponds, but year-round in ponds No. 3 to No. 5. Blue-green algae and littoral diatoms are relatively unimportant.

Many invertebrate phyla are represented; other than Arthropods, only a snail, *Nassarius obsoletus*, and a worm, *Polydora ligni*, are numerically important. Amphipods and copepods are numerous in ponds No. 1 and No. 2; one copepod, *Pseudodiaptomus euryhalinus*, is characteristic of pond No. 3; an insect, *Trichocorixa reticulata*, of pond No. 4; and *Artemia salina*, of pond No. 5.

Four species of fish occur; *Atherinopsis californiensis* is the most numerous and the most salt-tolerant.

Ponds No. 3 to No. 5 are always green; their water suspends an essentially uni-algal growth of *Stichococcus bacillaris*. Seasonal changes in its population were followed by optical density measurements. Maximum growth rate was about 1/10 that reported for this and other single-celled algae grown in mass culture.

Assimilation, estimated from oxygen production, averaged 3.9 mg. of carbon per liter per day in ponds No. 3 to No. 5; this represents a calculated yearly production of 6-1/2 tons (dry weight) of *Stichococcus* per acre, using 1/2 meter as average pond depth. Productivity of *Enteromorpha* in ponds No. 1 and No. 2 was about equal to this.

Dry weight and Kjeldahl-nitrogen determinations provided estimates of standing crop (170 to 190 mg. of *Stichococcus* per liter) representing 0.4 to 0.6 tons per acre.

Productivity of the ponds, by volume, is 20 to 30 times greater than that reported for coastal sea water.

Microfilm copy of complete manuscript of 204 pages, \$2.55. Enlargements 6" x 8", 10¢ per page. Library of Congress card number MicA54-325.

A STUDY OF MEIOSIS IN COELOMIC AND OVIDUCAL OOCYTES OF *TRITURUS VIRIDESCENS*, WITH PARTICULAR EMPHASIS ON THE ORIGIN OF SPONTANEOUS POLYPLOIDY AND THE EFFECTS OF TEMPERATURE SHOCK ON THE FIRST MEIOTIC DIVISION

(Publication No. 6818)

Asa Alan Humphries, Jr., Ph.D.  
Princeton University, 1953

The normal cytology of the first meiotic division in *Triturus viridescens* oocytes does not differ markedly from that described in most other Amphibia. Oviposition usually occurs just after formation of the first meiotic spindle. Most coelomic eggs, if not retarded in transit, are in metaphase I. First polar body formation usually occurs in the anterior one-third of the oviducts. Extremely few eggs in stages earlier than metaphase II are found in the posterior one-third of the oviducts.

Submerged and tangential first and second divisions occur with considerable frequency in untreated oocytes of *Triturus viridescens*. Submerged or tangential first divisions may lead either to second division spindles with the diploid number of dyads or to eggs with two independent haploid second division spindles, both of which have been observed. Submerged or tangential second divisions may lead to retention of the second polar body within the egg, thus forming a diploid gamete. All of these conditions probably result in the production of spontaneous polyploids or chromosome mosaics.

Heat treatment of coelomic and oviducal eggs results in destruction of the spindle and, in some cases, submergence of the chromosomes beneath the egg surface. Recovery of the division usually occurs within two hours and the first polar body is extruded normally. No potential polyploidizing effects were observed. The time required for the completion of the first meiotic division and formation of the second meiotic spindle *in vitro* at 19.6° C. is about nine to twelve hours. The first polar body usually begins to form about six hours after the formation of the first meiotic spindle.

Cold shock administered to laying females of *Triturus viridescens* results in a high incidence of mortality and noncleavage in eggs laid during the first twelve to fifteen hours after treatment. The majority of these eggs are apparently not fertilized. Eggs laid after this period are almost all normal. A few cytological observations indicate that the cold shock on eggs *in situ* has effects much like those of heat, in that the spindle is usually destroyed and the chromosomes are often submerged beneath the egg surface.

The mating behavior of *Triturus viridescens* is redescribed and certain modifications of the usual pattern are noted. Pituitary treated females are much more aggressive during mating than are non-treated females, sometimes undertaking the role of the male. Experience obtained in mating of *Triturus viridescens* in the laboratory is described.



Experiments dealing with the transfer of coelomic and oviducal eggs from one animal into the body cavity of another are described. Thus far slightly less than half the transferred eggs have been laid by the foster parents. Transferred eggs, if fertilized, usually develop normally. A high percentage of eggs transferred into the ostial region are laid in normal con-

dition. Transport of eggs through the oviduct requires as little as sixteen and one-half hours.

Microfilm copy of complete manuscript of 171 pages, \$2.21. Enlargements 6" x 8", 10¢ per page. Library of Congress card number MicA54-326.

## BOTANY

THE GROWTH OF NITZSCHIA PALEA  
AS AFFECTED BY  
CERTAIN ORGANIC MATERIALS

(Publication No. 7063)

Arthur A. Scharf, Ph.D.  
Northwestern University, 1953

Bacteria-free cultures of Nitzschia palea (Kützinger) Wm. Smith, obtained by plating of repeatedly washed and differentially centrifuged mass growth, were studied with respect to the effect of certain organic materials upon growth in the light and the possibility of growth in the dark using these materials as substrates.

No definite evidence of appreciable growth in the dark was found. Uncertainty exists, as seen in the relatively large standard deviations of the cell counts. It is very improbable that dark growth, if it exists, exceeded an average of one division per cell in thirteen days.

Addition of 0.01% sodium acetate, glucose, or glycerol was found to accelerate early stages of growth in light. Ultimate growth in these cases appears to be unaffected or somewhat decreased. Higher

concentrations of these substances resulted in decreased rate of growth and total growth, concentrations of 1% generally resulting in complete- or near-complete inhibition. Inhibition caused by acetate was, on a weight basis, generally more complete than that resulting from equal concentrations of glucose or glycerol. While data concerning the effect of acetate on growth in the light with low CO<sub>2</sub> concentrations were variable, there was some indication that the effect of acetate was proportional to the amount of growth in the non-acetate controls.

Yeast extract and beef extract were also found to accelerate growth in light. The effect of beef extract on the lag phase was particularly prominent. Cultures with media containing this material generally showed visible growth one day earlier than their controls.

The range of hydrogen ion concentration permitting growth in the light in modified Rodhe VIII culture solution, the standard medium for the investigation, was found to be approximately from pH 6 to pH 10.

Microfilm copy of complete manuscript of 55 pages, \$1.00. Enlargements 6" x 8", 10¢ per page. Library of Congress card number MicA54-327.



## CHEMISTRY

### CHEMISTRY, GENERAL

#### A PROCEDURE FOR THE SPECTROGRAPHIC DETERMINATION OF COPPER, TIN AND TITANIUM IN IRON AND STEEL

(Publication No. 6857)

Edward A. Rowe, Ph.D.  
Michigan State College, 1948

A spectrographic procedure is described for the rapid and accurate quantitative determination of large amounts of copper, tin and titanium in iron and steel. The method devised for the homogeneous incorporation of known amounts of alloying constituents into known amounts of iron for samples is presented. Homogeneity is further enhanced by forging and cold saging of the material into rods for use as electrodes. With controlled conditions results were obtained which showed satisfactory agreement with chemical analysis. Influence of the length of pre-spark time and of the size of the electrodes on the accuracy of the procedure is discussed.

The analytical procedure involves the use of an iron reference line for the quantitative determination of the elements in iron or steel. Tables illustrating the lines used, excitation conditions, developing procedure and accuracy to be expected of the determination of tin in iron and steel by both the solid electrode method and the copper spark method are presented.

Microfilm copy of complete manuscript of 45 pages, \$1.00. Enlargements 6" x 8", 10¢ per page. Library of Congress card number MicA54-328.

### CHEMISTRY, BIOLOGICAL

#### A STUDY ON THE BIOLOGICAL UTILIZATION OF THE POLYHYDROXY ESTERS OF LINOLEIC ACID

(Publication No. 6953)

Howard Minor Hickman, Ph.D.  
University of Illinois, 1953

Linoleic acid was esterified with ethylene glycol, polyoxyethylene glycols of mean molecular weight 200, 400, and 600, mannitol and Tween polyol (the non-fat fraction of polyoxyethylene sorbitan mono-oleate). Para-toluene sulfonic acid was used as a catalyst; carbon dioxide was used to maintain an inert atmosphere. The unreacted polyalcohol was removed by shaking the reaction mixture with ethyl

acetate and saturated aqueous sodium chloride. The free fatty acid was removed by passing the esters through an ionic exchange resin. The hydroxyl number, linoleic acid and isomerized linoleic acid content, and iodine number of the esters was determined.

The esters and free fatty acid were fed to groups of acrodynic and normal weanling rats for periods of 3 weeks and 6 weeks respectively. The animals received a low fat, low pyridoxine ration during the study. It was determined that:

1. Both groups of animals were capable of hydrolyzing the esters. This was indicated by the deposition of essential fatty acids in the tissues, relief or prevention of the dermal symptoms associated with acrodynia and by a general gain in weight.

2. The various esters seemed to have different biological activities. The amount of linoleic acid in the daily dosages was essentially the same in all the esters. Yet the acrodynic animals fed esters with the larger polyoxyethylene glycol moiety gained more weight than those that were supplemented with low molecular weight polyglycol esters. The latter esters were, however, more effective in relieving dermal symptoms.

Microfilm copy of complete manuscript of 50 pages, \$1.00. Enlargements 6" x 8", 10¢ per page. Library of Congress card number MicA54-329.

#### THE RELATIONSHIP OF DIETARY FAT AND RIBOFLAVIN TO THE CARCINOGENIC ACTIVITY OF PARADIMETHYLAMINOAZOBENZENE

(Publication No. 6954)

Glen Arthur Jacobson, Ph.D.  
University of Illinois, 1953

Weanling rats were raised to maturity on a fat-free basal diet, divided into various groups, and the diet supplemented with various levels of corn oil, cottonseed oil, hydrogenated cottonseed oil, and riboflavin. Paradimethylaminoazobenzene, fed at a .06% level, was used as a carcinogenic agent.

Animals were sacrificed at 8, 14, and 22 weeks, and their livers analyzed for riboflavin and component fatty acids. Urinary and fecal riboflavin determinations were made at 8 and 14 weeks.

The addition of unsaturated fat to a diet containing DAB increased tumor incidence in proportion to the amount of added fat. Furthermore, approximately 4 times as much of the absolute amounts of unsaturated fatty acids were found in cancerous tissue as in normal tissue.

The fatty acid composition of a normal appearing lobe from a cancer-bearing liver had a higher oleic

acid content than the completely cancerous portion, or that of a normal liver.

The addition of an unsaturated fat also lowered liver riboflavin to a level where tumors occurred in animals which had received DAB in addition to the fat.

DAB alone had little effect on fat metabolism, but appeared to diminish intestinal synthesis of riboflavin in rats on a fat-free diet.

DAB plus either unhydrogenated or partially hydrogenated fat changed the ratio of saturated to oleic acid in favor of the oleic acid. This was counteracted by the addition of extra riboflavin to the diet.

The addition of either unhydrogenated or partially hydrogenated fat to a diet containing DAB lowered liver riboflavin to a level which resulted in high tumor incidence in the rats.

Considerable amounts of riboflavin were apparently synthesized by the intestinal flora of rats fed a fat-free diet. High levels of unhydrogenated or partially hydrogenated fat in the diet appeared to inhibit intestinal synthesis of riboflavin.

Microfilm copy of complete manuscript of 35 pages, \$1.00. Enlargements 6" x 8", 10¢ per page. Library of Congress card number MicA54-330.

#### PHOSPHORUS METABOLISM IN THE NUCLEOLUS OF RAT LIVER NUCLEI

(Publication No. 6913)

Darrell Neilsen Ward, Ph.D.  
Stanford University, 1953

Since cytochemical staining evidence indicates that most or all of the nuclear ribonucleic acid is located in the nucleolus a study was made of the uptake of labeled phosphate into this fraction isolated by chemical means. The uptake in this fraction was studied for both normal and precancerous rats (precancerous rats were those fed the azo dye 3' methyl-4-dimethyl-aminoazobenzene for a period of six to eight weeks). Measurements were obtained on groups of animals sacrificed at one-half hour intervals after intraperitoneal administration of the radioactive phosphate for the period up to four hours. Measurements were also made at five, eight and eighteen hours after isotope administration. Liver nuclei were isolated by differential centrifugation from a citric acid suspension of the liver homogenate. Nuclear ribonucleic acid was obtained as the constituent nucleotides liberated by alkaline hydrolysis of the acid and lipid extracted nuclei. The nucleotides were separated from each other and from inorganic phosphate liberated from phosphoprotein by means of paper chromatograms.

Uptake of phosphorus did not differ markedly in either the precancerous or normal rat liver nuclear ribonucleic acid fraction, although both groups varied widely during the period two to four hours. A possible contribution of dietary effects on the latter variations was discussed briefly. The data were not sufficiently extensive to establish reliable graphs of uptake versus time.

The individual nucleotides did not differ significantly from one another in the rate of phosphorus uptake except in some of the groups at three to eight hours after isotope administration the adenylic acid was about thirty percent higher than the other nucleotides.

Other work has shown that precancerous liver is similar to regenerating liver in that both have an increased rate of incorporation of phosphorus into deoxyribonucleic acid. Nuclear ribonucleic acid also has an increased uptake in regenerating liver. This work points out that the latter fraction is not greatly altered as to rate of uptake during the precancerous period.

The inorganic phosphate liberated after hydrolysis with concentrated ammonium hydroxide had a lower specific activity than that obtained after sodium hydroxide hydrolysis. The inorganic phosphate, presumably from phosphoprotein, was about the same specific activity as the nucleotides when obtained by ammonium hydroxide hydrolysis.

An interesting residue containing large quantities of bound dye was obtained from the nuclei of animals fed the azo dye. This residue was not very much decomposed by the small quantity of sodium hydroxide used to hydrolyze the acid and lipid extracted residues of the nuclei.

Microfilm copy of complete manuscript of 113 pages, \$1.41. Enlargements 6" x 8", 10¢ per page. Library of Congress card number MicA54-331.

#### THE STABILITY OF NATURAL FATS AS AFFECTED BY THE INTERACTION OF PHOSPHOLIPIDS, CAROTENOIDS AND TOCOPHEROLS

(Publication No. 7009)

Winston Harold Wingerd, Ph.D.  
University of Illinois, 1952

The problem of rancidification in fats and oils and its prevention has been the subject of a great number of studies during the past two decades. Until about 1940 most of these investigations were concerned with enhancing the stability of extracted fats and oils. However, since that time the more difficult problems of preventing rancidity in the fat of meat and other whole tissues has received more and more attention due to the advent of cold storage as a means of food preservation (1, 2, 3, 4, 5, 6, 7, 8).

The stability of fats is known to be affected by two factors: one, their fatty acid composition (9, 10, 11, 12) and two, the amount and nature of existing natural anti- or pro-oxidants (13, 14, 15, 16, 17). In the case of animal fats, both of these factors can be affected by the diet. However, economic considerations limit the extent to which the fatty acid composition of animal fats can be controlled, since the fats of all green feed stuffs as well as those of the cereal grains contain large amounts of the highly unsaturated acids. Consequently, when these cheap feedstuffs are included in the ration, highly unsaturated fatty acids are ingested and deposited in the tissue fats.



Therefore, if the problem of fat rancidity of foods such as bacon, pork, butter and poultry is to be solved by dietary means, the solution must lie in stimulating maximum deposition of antioxidative substances in the tissue fats. Certain substances such as the tocopherols, phospholipids and carotenoids are known to be deposited by the animal in its fat depots and to affect the stability of the fat. However, the combination of these natural antioxidants and synergists which will give maximum stability to the unsaturated fatty acids of tissue fats is still unknown. The present study was initiated in an attempt to clarify some of the confusion which now exists in regard to the interaction of tocopherols, phospholipids and carotenoids as they inhibit or promote fat oxidation and to gain information of the stability to be expected if the concentration of one or more of these substances can be increased in the tissue fats by dietary means. As yet, no attempts have been made to correlate the stability of tissue fats with their carotenoid content. However, in view of the relative ease (18) with which carotenoids are incorporated into tissue fats and the fact that under the right conditions they do act as antioxidants, an investigation of this type was considered of interest. In addition, very little information is available concerning tissue fat stability as affected by concentration variations in the other minor lipids such as tocopherol and phospholipids. Lundberg et al. (4) have shown by means of feeding experiments that the tocopherol content of tissue fats can be greatly increased over the amount normally present without giving a significant improvement in the fat stability. Apparently, therefore, it is necessary to stimulate the deposition of additional synergist in the tissue fats along with tocopherol if greater inherent stability is to be produced in tissue fats. If such is the case, an investigation of the tocopherol concentration-phospholipid concentration ratio which will give maximum stability to tissue fats is also of interest. Chicken fat was selected for a study of this type in view of its unstable nature and the benefits that would result from an increase in its stability.

#### Materials and Methods

Chicken skin tissue was exhaustively extracted in succession with acetone, ethyl alcohol and Skellysolve B. The fat obtained from the combined extracts was then stripped of its phospholipids, tocopherols and carotenoids by precipitation with acetone, molecular distillation and adsorption on magnesium oxide, respectively.

The phosphorus content of the phospholipids and whole fats was determined as described by Verma (19) for the digestion of the sample and as described by Fiske and Subbarow (20) for the color development.

Crystalline lycopanthin was prepared from the berries of *Solanum dulcamara* as described by Winterstein and Ehrenbert (21) for the isolation of zeaxanthin from the berries of *Lycium barbarum*. Lutein was isolated from stinging nettles by the method of Kuhn, Winterstein and Lederer (22). Bixin was prepared from annatto by the method of Sumner and Smith (23).

Buttermilk phospholipids were extracted according

to the procedure described by Stull, Herreid and Tracy (24) except that a Mojonnier low temperature evaporator was used to reduce the volume of the buttermilk. Butter oil was prepared by holding butter at 70° C. under vacuum until all of the water had been drawn off and the casein curd had settled out.

Induction periods were determined by the oxygen absorption method and oxidation rates were measured in a constant volume respirometer of the Warburg type.

#### Discussion of Results

A study has been made of the effect which various combinations of phospholipids, carotenoids and tocopherol have on the stability of several natural fats. In the initial experiments the phospholipids, tocopherols and carotenoid pigments were removed from chicken skin tissue fat by acetone precipitation, molecular distillation and chromatography, respectively. Various concentrations of the phospholipid and tocopherol fractions were then added back to the triglycerides from which they were removed and their effect on the induction period of the fat at 70° C. was determined. The amount of tocopherol normally present in chicken fat had little stabilizing effect on the fat in the absence of the phospholipids. Only in combination did these two components of chicken fat markedly increase the induction period of the fat at 70° C. Furthermore, the phospholipids and tocopherol had to be present in a definite ratio in order to give maximum stability and this ratio was almost the same as the ratio naturally present in the whole chicken fat. Therefore, it appears that the fat of whole skin tissue cannot be greatly stabilized by stimulating the deposition in the tissue of larger amounts of either tocopherol or phospholipids by themselves. The concentrations of both tocopherol and phospholipids or, perhaps, some other synergist, must be increased proportionately in order to obtain significant increases in fat stability. A mechanism for the anti-oxygenic action of phospholipids in association with tocopherols is discussed.

The carotenoid pigments of chicken fat has a pro-oxidant effect on the purified triglycerides at 70° C. However, when the phospholipid fraction was added along with the carotenoids, the pro-oxidative effect of the latter was almost completely nullified. Several crystalline carotenoids which were isolated from vegetable sources gave similar results. On the other hand, when both tocopherol and phospholipid fractions were present and the induction period consequently prolonged due to their synergistic action, the pro-oxidative effect of the carotenoids was again apparent in that the induction period was decreased.

Additional studies on the interaction of phospholipids, carotenoids and tocopherol in autoxidizing fats were conducted with butter oil as a substrate. The necessity for maintaining a definite tocopherol-phospholipid ratio in order to get maximum stability was again observed. Carotene and zeaxanthin were used in these experiments and both pigments acted as pro-oxidants in butter oil at 70° C. Furthermore, the pro-oxidant effect of zeaxanthin was always greater than that of carotene. However, the magnitude of



these pro-oxidative effects could be decreased by a tocopherol-phospholipid ratio which was greater than that which gave maximum stability to the control. Also, under these conditions the pigments caused a slower rate of oxygen uptake during the induction period.

In butter, no induction period was observed; rather, the autoxidation proceeded at a fairly constant rate which was fixed early in the course of the oxidation. Carotene had a slight pro-oxidant effect and bixin showed a slight antioxidant effect as indicated by the rates of oxygen uptake. Zeaxanthin had no significant effect on the rate of oxygen uptake by butter. However, in combination with buttermilk phospholipids, all three pigments showed marked synergism to inhibit the rate of oxidation. The zeaxanthin-phospholipid combination gave the greatest decrease in oxidation rate and the bixin and carotene combinations followed in that order. Data which was obtained by oxidizing pure ethyl linoleate indicate that the effects of moisture, temperature and microorganisms do not contribute significantly to the synergism of carotenoids with phospholipids in butter. A mechanism is proposed to explain the anti- and pro-oxidant effects of the carotenoid pigments.

#### Conclusions

1. The amount of tocopherol normally present in chicken fat has little stabilizing effect on the fat in the absence of the phospholipid fraction.
2. Tocopherol and phospholipids must be present in a definite ratio in order to give maximum stability to a fat and this ratio is almost the same as the ratio naturally present in whole chicken fat.
3. Carotenoid pigments have a pro-oxidant effect on the purified triglycerides of chicken fat at 70° C. and phospholipids partially inhibit this pro-oxidant effect.
4. Zeaxanthin is a stronger pro-oxidant than carotene in butter oil.
5. Carotene, bixin and zeaxanthin have little effect on the oxidation rate of butter; however, when added to butter along with buttermilk phospholipids, all three pigments act synergistically with the phospholipids to inhibit the rate of oxidation. Zeaxanthin and bixin were most effective in this respect.

Microfilm copy of complete manuscript of 74 pages, \$1.00. Enlargements 6" x 8", 10¢ per page. Library of Congress card number MicA54-332.

#### CHEMISTRY, INORGANIC

##### THE DETERMINATION OF TRACE QUANTITIES OF BISMUTH. I. COLORIMETRIC DETERMINATION OF TRACES OF BISMUTH IN LEAD. II. COLORIMETRIC DETERMINATION OF TRACES OF BISMUTH IN COPPER. III. NEPHELOMETRIC DETERMINATION OF BISMUTH

(Publication No. 6922)

Bruce Burton Burnett, Ph.D.  
University of Illinois, 1953

Trace quantities of bismuth give rise to unfavorable metallurgical properties in lead and copper. As little as 0.001 percent bismuth causes corrosion of lead equipment used in the manufacture of smokeless powder, and lead containing bismuth should be used only when the metal is not exposed to acid-corrosive media (1). Consequently, it is necessary to be able to determine as little as 0.001 percent bismuth in lead, and knowledge of amounts below this level is desirable. Quantities of the order of 0.001 percent bismuth can cause embrittlement of copper at temperatures between 450 and 600° C (4), and it is necessary to establish limits on the bismuth content of commercial copper. The objective of this investigation was to make a critical examination of the existing methods for the determination of bismuth and to develop an improved method, utilizing such techniques as would be required to attain the desired sensitivity and degree of reliability for the analysis of lead and copper materials.

The spectrographic technique was found to lack the required sensitivity when applied to lead samples. Solution techniques involving preliminary separation of lead as the chloride followed by A. C. and D. C. Arc excitation and A. C. spark excitation were employed as well as spark excitation of metallic lead electrodes.

Other techniques for the determination of trace quantities of bismuth were then reviewed, and the colorimetric iodide method (3) was selected on the basis of its simplicity, sensitivity, accuracy, and applicability in the presence of a relatively large number of foreign ions. Lead, thallous, and cuprous ions form insoluble iodides if present in large enough amounts while antimony, like bismuth, forms a yellow color with excess iodide. However, 20 mg. of antimony per 100 ml. in a 1 cm. absorption cell or 1 mg. per 5 ml. in a 5 cm. cell show negligible absorption under the conditions used to estimate bismuth.

Further evaluation of the iodide method indicates that the most satisfactory results are obtained by measuring the color intensity at 460 mμ in aqueous solution using hypophosphorous acid to prevent iodide oxidation. Extraction of the complex into organic solvents is attended by difficulties due to iodine formation and instability of the extracts. Although the absorption maximum at 336 mμ is of slightly greater intensity, the problem of interferences makes its use less satisfactory than measurement of the absorption at the longer wavelength (460 mμ).

In order to separate and concentrate the bismuth before colorimetric determination a gathering technique based on collection of bismuth (III) in slightly acidic or alkaline medium on silica flour (celite or Super Cel) was developed. After gathering, the bismuth is eluted with dilute sulfuric acid and determined colorimetrically. Silica is superior to other collectors such as ferric hydroxide, manganese dioxide, aluminum hydroxide, or metallic copper because it allows rapid and quantitative gathering of bismuth in one step, provides complete separation from copper without reprecipitation, and, most important, it does not add foreign ions to the system because it is chemically inert. Lead must be separated prior to the gathering step, and the chloride precipitation recommended by Robinson is utilized rather than precipitation of lead sulfate which is reported to occlude bismuth (2). Copper samples do not require preliminary separation of copper since it can be converted to the soluble ammonia complex when the bismuth is collected on the silica. Procedures for both copper and lead materials are rapid, reliable, easy to carry out, and capable of application over a wide range since from 10 gamma to 10 mg. of bismuth can be collected quantitatively from a 20 g. sample of lead or a 2 g. sample of copper. It is also suggested that the gathering technique might find application to analysis of biological materials.

A nephelometric procedure for bismuth based on precipitation of cinchonine iodobismuthite is also described. Although capable of extreme sensitivity (0.04 ppm. bismuth) a mixture of Tergitol 7 and dextrin is required to disperse and stabilize the suspension, and a complex system results. Because of the great sensitivity the procedure may find application in special cases, but the possible effect of extraneous substances must be carefully studied before adopting the method.

#### BIBLIOGRAPHY

1. George, W., and Ennslin, F., *Metall u. Erz*, **37**, 6 (1940) C. A. **34**, 7236.
2. Robinson, R. G., *Analyst*, **64**, 402 (1939).
3. Sandell, E. B., "Colorimetric Determination of Traces of Metals," Interscience Publishers, Inc., New York, 1950, pp. 210-226.
4. Voce, E., and Hallows, A. P. C., *J. Inst. Metals*, **73**, 839 (1949).

Microfilm copy of complete manuscript of 133 pages, \$1.66. Enlargements 6" x 8", 10¢ per page. Library of Congress card number MicA54-333.

#### APPLICATION OF THE SPECTROPHOTOMETRIC END POINT IN VOLUMETRIC ANALYSIS: THE USE OF THE VISIBLE AND ULTRAVIOLET REGION OF THE SPECTRA

(Publication No. 6841)

Philip Bliss Sweetser, Ph.D.  
Princeton University, 1953

The number of applications, and literature on photometric or spectrophotometric end point techniques is very small when compared to potentiometric, conductometric, and amperometric methods for determining the end point of volumetric reactions. The use of the ultraviolet region in spectrophotometric titrations has been even more neglected, in fact, no previous literature on the use of this spectral region for detecting the end point was found. The sensitivity and general versatility of this spectrophotometric technique is increased many fold by working in the ultraviolet region.

This thesis has been under taken in an effort to bring forth the advantages and to increase the popularity of the spectrophotometric titration in volumetric analysis. The ultraviolet region has, because of its many advantages, been used in a majority of the spectrophotometric titrations presented in this study.

The following applications are presented in this thesis, with the exception of the introduction, in the original form in which they were published (or submitted) in *Analytical Chemistry*.

1. Spectrophotometric titrations with ceric (IV) sulfate solutions for the determination of microquantities of arsenic. In this study of the determination of arsenic, a Beckman DU Spectrophotometer was used at a wave length of 320 m $\mu$  where the ceric (IV) sulfate showed a maximum absorbancy.

It was possible to prepare stable ceric (IV) solutions as dilute as  $10^{-4}$  and to determine the end point with these dilute solutions with an accuracy of 1 to 2 P.P.T. in the determination of arsenic in the concentration range of 0.066 to 33.0 Mg.

2. A further study was made with the use of ceric (IV) solutions as a titrant in the determination of uranium and iron when present separately or in mixtures. The uranium and/or iron solutions are reduced with a 90 percent cadmium amalgam reductor. The reduced solution is titrated with standard ceric (IV) sulfate using a Beckman Model B Spectrophotometer at a wave length of 340-360 m $\mu$ . The titration curve of an iron (II) and uranium (IV) solution gave three slopes with intersections corresponding to the amount of uranium (IV) and iron (II) present. The acid concentration, the composition of the cadmium reductor, the rate of the oxidation between uranium (IV) and iron (II), and the effect of induced air oxidation of uranium (IV) in the presence of iron (II) were studied. Milligram quantities of uranium and iron individually can be determined with an accuracy of about 3 P.P.T. With mixtures of these two ions, the error is slightly larger.

3. Spectrophotometric titrations with bromate-bromide solutions were investigated, and a simple bromometric procedure for addition and substitution



reactions as well as for some inorganic applications was developed. This spectrophotometric end point utilized the absorption of the tri-bromide ion at wavelengths of 270 to 360  $m\mu$ .

A single spectrophotometric titration was also applied to the simultaneous determination of arsenic and antimony in mixtures of the substances.

4. The spectrophotometric end point is a very rapid and convenient procedure for titrations with ethylenediamine tetraacetic acid (Versenate). A procedure is given for the use of this end point in the determination of iron, copper, and nickel with standard Versenate solutions. The effects of pH and foreign ions on these procedures were investigated. With this method it is possible without any separations to determine copper in many nonferrous alloys and iron in ferrous alloy and ores by a single, simple titration. A titration cell is described for use with the Beckman Model B Spectrophotometer.

5. In an effort to extend the versatility of ethylenediamine tetraacetic acid (Versenate) as a volumetric reagent, the ultraviolet region of the spectrum has been studied for further use in the spectrophotometric determination of the end point of Versenate titrations. A procedure is given for the use of the spectrophotometric end point in the determination of: calcium, magnesium, cadmium, and zinc in ammonia-ammonium chloride buffered solutions; calcium in the presence of magnesium and cadmium in the presence of zinc in sodium hydroxide solutions. In addition, a volumetric method is presented for the determination of zirconium which involves the titration of an excess of Versenate with iron (III) solution. A titanium-peroxide-Versenate complex was also found that was stable at low pH's. The sensitivity of the spectrophotometric end point allows the use of Versenate solutions as dilute as 0.001 M or less even when the total volume of the solution being titrated is 100 ml.

Microfilm copy of complete manuscript of 92 pages, \$1.15. Enlargements 6" x 8", 10¢ per page. Library of Congress card number MicA54-334.

## CHEMISTRY, ORGANIC

### I. THIOPHENE DERIVATIVES OF HYDRAZINE. II. SYNTHESIS OF 1,4-THENOPYRROLE-2-CARBOXYLIC ACID

(Publication No. 6923)

Louis Albert Carpino, Ph.D.  
University of Illinois, 1953

#### PART I

##### Introduction

One of the most important of the many syntheses of indole derivatives is the Fischer cyclization of substituted phenylhydrazones.<sup>1</sup> In the present study,

a search was made for suitable methods for the preparation of derivatives of 2- and 3-thienylhydrazine, since such compounds might prove to be useful in the synthesis of thiophene analogs of indole. Furthermore, the extreme usefulness of phenylhydrazine and its derivatives indicates that the synthesis of 2- or 3-thienylhydrazine would prove of importance in the general expansion of the fundamental chemistry of thiophene.

##### Discussion

It has been found that derivatives of 3-thienylhydrazine can be prepared by treatment of the corresponding hydroxy compounds with benzhydrazine. A second method for the preparation of thienylhydrazine derivatives involves treatment of 2-thienylmagnesium bromide with azo compounds. Thus, azodibenzoyl leads to the formation of N,N'-dibenzoyl-2-thienylhydrazine, although it was not possible to hydrolyze the hydrazide to the free base.

During investigation of the second method for the synthesis of thienylhydrazines, the reaction between Grignard reagents and unsymmetrical diacyl azo compounds was examined. When Grignard reagents are added to such azo compounds as benzoylacetyldiimide, ethyl acetyazofornate, benzyl benzoylazofornate, and benzyl acetylazofornate it is found that, in general, a single product is obtained, the constitution of which is determined by the following order of acyl groups to promote conjugate addition:  $C_6H_5CO \rightarrow ROCO \rightarrow CH_3CO$ . The constitution of the compounds obtained from these diimides and 2-thienylmagnesium bromide was inferred on the basis of the mode of addition of phenylmagnesium bromide to the same azo compounds.

#### PART II

##### Introduction

Certain compounds which are structurally similar to tryptophan, such as 6-methyltryptophan,<sup>2</sup> have been shown to act as anti-metabolites for this important amino acid. Because the thiophene analogs<sup>3</sup> of physiologically active compounds often show such activity, a study was undertaken with the purpose of synthesizing the analogs of indole in which the benzene ring is replaced by the thiophene nucleus, since many methods have already been developed for the conversion of indoles to the corresponding tryptophans.

##### Discussion

A thiophene analog of indole-2-carboxylic acid, 1,4-thenopyrrole-2-carboxylic acid, has been synthesized via the reaction sequence: thiophene, 2,5-dibromothiophene, 2-methyl-5-bromothiophene, 2-methyl-5-thenoic acid, 2-methyl-3-nitro-5-thenoic acid, 2-methyl-3-nitrothiophene, 3-nitro-2-thenal bromide, 3-nitro-2-thenaldehyde, 2-methyl-4-(3-nitro-2-thenal)-5-oxazolone, 3-nitro-2-thienylpyruvic acid, 1,4-thenopyrrole-2-carboxylic acid. This is believed to be the first example of the synthesis of a simple compound containing the fused pyrrole-thiophene ring system.

A similar reaction sequence was examined for the preparation of the isomeric acid,



1,6-thenopyrrole-2-carboxylic acid: 3-methylthiophene, 2-nitro-3-methylthiophene, 2-nitro-3-thenyl bromide, 2-nitro-3-thenyl alcohol, 2-nitro-3-thenaldehyde, 2-methyl-4-(2-nitro-3-thenal)-5-oxazalone, 2-nitro-3-thienylpyruvic acid, 1,6-thenopyrrole-2-carboxylic acid. This synthesis was completed up to the preparation of the pyruvic acid. Preliminary attempts to reduce the pyruvic acid to the thenopyrrole were not successful.

1. Benary and Baravian, *Ber.*, **48**, 593 (1915).
2. Pilgrim, Ph.D. Thesis, University of Illinois, Urbana, Illinois, 1949.
3. Dittmer, *J. Am. Chem. Soc.*, **71**, 1205 (1949).

Microfilm copy of complete manuscript of 115 pages, \$1.44. Enlargements 6" x 8", 10¢ per page. Library of Congress card number MicA54-335.

## MANNICH REACTIONS OF PYRIMIDINES

(Publication No. 6942)

Harold Marvin Foster, Ph.D.  
University of Illinois, 1953

### Introduction

Numerous aldol type reactions in the pyrimidine series involving either methyl substituents or the nucleus have been observed. In general, simple methylpyrimidines undergo reaction at the methyl group,<sup>1</sup> whereas methylpyrimidines which have any combination of two or more hydroxy, amino, or thio substituents undergo nuclear condensation.<sup>2,3,4,5,6</sup> 4-Methyl-6-hydroxypyrimidine<sup>7</sup> and 2-hydroxy-4,6-dimethylpyrimidine,<sup>8</sup> two methylpyrimidines which have but a single ring-activating substituent, react with aromatic aldehydes to yield styryl derivatives.

It was felt that it would be of interest to determine the reactivity of a methylpyrimidine having but a single ring-activating substituent in a mild aldol condensation, namely the Mannich reaction. To this end an investigation of the Mannich reaction of 2,6-dimethyl-4-hydroxypyrimidine and of 2-methylmercapto-4-methyl-6-hydroxypyrimidine was undertaken. The purpose of this investigation was to elucidate the structures of any Mannich bases which might be isolated and to correlate the effects of nuclear substituents and of reaction conditions with the reactivity of pyrimidines in aldol type reactions.

### Theoretical and Discussion

#### A. Preparations of Pyrimidines

The investigation of the Mannich reaction of 2,6-dimethyl-4-hydroxypyrimidine (I) was severely hampered because of the difficulty involved in obtaining sufficient hydroxypyrimidine. The procedure of Pinner<sup>9</sup> for the preparation of 2,6-dimethyl-4-hydroxypyrimidine and the procedure of Donleavy and Kise<sup>10</sup> for the preparation of 6-methyluracil were

consolidated and modified to give I in yields of about 73%. 2-Isopropyl-4-methyl-6-hydroxypyrimidine was synthesized by this modified procedure, also. The synthesis of 2-thio-6-methyluracil was modified and simplified. 4-Methyl-6-hydroxypyrimidine and 4-ethyl-6-hydroxypyrimidine were prepared by desulfurization of the corresponding 2-thio derivatives by the procedure described by Brown.<sup>11</sup> Three types of Raney nickel catalyst were evaluated as desulfurizing agents.

#### B. Reactions of Pyrimidines and Derivatives

2,6-Dimethyl-4-hydroxypyrimidine (I) reacts with formaldehyde and piperidine to yield two Mannich bases, a bis(1-piperidylmethyl) derivative (II) and a tris(1-piperidylmethyl) derivative (III). Similarly, I reacts with morpholine and formaldehyde to yield a bis(1-morpholinomethyl) derivative. Condensation of I with dimethylamine and formaldehyde was attempted under a variety of conditions. No solid products were ever isolated.

The bis(1-piperidylmethyl) derivative (II) of I was shown to be 2-bis(1-piperidylmethyl)methyl-4-methyl-6-hydroxypyrimidine by reductive cleavage of the carbon to nitrogen bond of the Mannich base to yield 2-isopropyl-4-methyl-6-hydroxypyrimidine. Further evidence for the structure assigned was reductive cleavage of the pyrimidine ring to yield *n*-butyramide. This reaction appears to be a true reductive cleavage. However, the reductive ring cleavage is not a general reaction of hydroxypyrimidines.

II reacted with excess methyl iodide to yield a compound formulated as 2-(4-methyl-6-hydroxy-2-pyrimidyl)-4-azaspiro [3,5] nonane iodide. Evidence which supports this formulation is that the derivative contains ionic iodine and that when an aqueous solution of the compound was treated with sodium carbonate, no basic material could be extracted into benzene. Moreover, the compound decomposed rapidly in the basic solution to yield a red oily tar.

The carbon to nitrogen bonds of the Mannich base (II) were cleaved by reaction with acetic anhydride. The expected *N*-acetyl piperidine was isolated from the reaction mixture. The expected diacetoxyl derivative of I was not found. However, a crystalline solid which differed from II by the elements of two molecules of piperidine was isolated. This material is probably polymeric.

A preliminary hydrogenation of the tris(1-piperidylmethyl) derivative (III) of I indicated that two of the piperidylmethyl groups were equivalent, whereas the third was different. The formulation of 2-bis(1-piperidylmethyl)methyl-4-(1-piperidyl-2-ethyl)-6-hydroxypyrimidine was suggested for this compound.

2-Methylmercapto-4-methyl-6-hydroxypyrimidine and 2-thio-6-methyluracil react with piperidine and formaldehyde in 95% ethanol solution to yield piperidylmethyl derivatives. That condensation in both cases had occurred at the same position of the pyrimidine was shown by desulfurization of both Mannich bases to the same piperidylmethyl derivative of 4-methyl-6-hydroxypyrimidine. The desulfurized Mannich base was converted to a benzylmercapto derivative.

1. S. Gabriel and J. Colman, *Ber.*, **36**, 3383 (1903).

2. W. Kircher, *Ann.*, **385**, 293 (1911).
3. K. Schmedes, *ibid.*, **441**, 192 (1925).
4. G. Poetsch and R. Behrend, *ibid.*, **448**, 89 (1926).
5. T. B. Johnson and A. Litzinger, *J. Am. Chem. Soc.*, **58**, 1940 (1936).
6. M. Ohta, *J. Pharm. Soc. Japan*, **67**, 175 (1947), *C. A.*, **45**, 9545<sup>5</sup> (1951).
7. D. M. Brown and W. C. J. Ross, *J. Chem. Soc.*, 1715 (1948).
8. O. Stark, *Ber.*, **42**, 699 (1909); O. Stark and M. Bögeman, *ibid.*, **43**, 1126 (1910).
9. A. Pinner, *ibid.*, **22**, 1612 (1889).
10. J. J. Donleavy and M. A. Kise, *Organic Syntheses*, Coll. Vol. 2, John Wiley and Sons, Inc., New York, second edition, 1943, p. 422.
11. D. J. Brown, *J. Soc. Chem. Ind.*, **69**, 353 (1950).

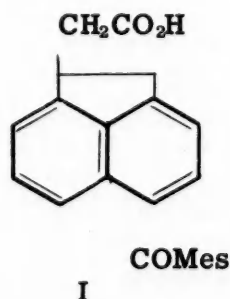
Microfilm copy of complete manuscript of 72 pages, \$1.00. Enlargements 6" x 8", 10¢ per page. Library of Congress card number MicA54-336.

#### THE STRUCTURE OF MICHAEL ADDUCTS OF 5-MESITOYLACENAPHTHYLENE

(Publication No. 6943)

Sheldon Ellsworth Frey, Ph.D.  
University of Illinois, 1953

In the course of his studies on 5-mesitoylacenaphthylene Mange (1) observed that this compound gave Michael condensation adducts with ethyl malonate or ethyl cyanoacetate. Both of the adducts when hydrolyzed and decarboxylated gave the same product which was assumed to be 5-mesitoyl-1-acenaphtheneacetic acid (I)



on the basis of 1,8 conjugate addition to the hindered ketone. This was thought to be possible by the activation of the mesitoyl group and with the presence of the double bond in the *peri*-bridge. While this reaction was both novel and interesting from a theoretical standpoint, it was important to establish conclusively the structure of the isolated acid. In general, the current work was concerned with an alternate synthesis of this product.

Two alternate methods of synthesis of the desired acid were found in this research, one of which was based on the known 1,5-dibromoacenaphthene (2) and thus it became a structure proof for the above acid. Acenaphthene was converted to 1-acetoxyacenaphthene (3) which was brominated to give 1,5-dibromoacenaphthene (4).

When this dibromide was condensed with ethyl acetoacetate it was possible to obtain 5-bromo-1-acetonyl-acenaphthene. The cyclic ketal of this compound was prepared by using ethylene glycol in the presence of *p*-toluenesulfonic acid. With *n*-butyllithium the exchange of the bromine atom of the ketal for lithium was effected and allowing this intermediate to react with mesitoyl chloride gave 1-acetonyl-5-mesitoyl-acenaphthene after acid hydrolysis of the reaction mixture. The same intermediate gave 1-acetonyl-5-acenaphthenecarboxylic acid on carbonation. The diketone was readily converted, though in a low yield, to the desired 5-mesitoyl-1-acenaphtheneacetic acid. This product had the same melting point as the acid obtained from the Michael condensation and a mixture melting of the two samples showed no depression. They also had identical infrared spectra. The preceding reactions constituted a verification for the assumed 1,5 orientation of the Michael product.

Mange (1) had utilized 1-bromo-5-mesitoylacenaphthene (5) in the preparation of 5-mesitoylacenaphthalene. The second alternate method of synthesis of the acid (I) was achieved by condensation of the 1-bromoketone with ethyl malonate. The 1-acetonyl-5-mesitoylacenaphthene obtained in the above structure proof was also made from the 1-bromoketone utilizing ethyl acetoacetate. These reactions established conclusively that the orientation of 1-bromo-5-mesitoyl-acenaphthene assumed by Mange was correct.

Degradative approaches to the problem were abandoned when it was found that both 5-mesitoylacenaphthene and 1-mesitoylnaphthalene lost the mesitoyl group rather than the mesitoyl group on treatment with 85 percent orthophosphoric acid.

Several new compounds were prepared in an attempted synthetic approach utilizing an ether intermediate. The 1,5-dibromoacenaphthene gave 5-bromo-1-acenaphtheneacetic acid (2) on condensation with ethyl malonate. This acid was reduced to the corresponding alcohol with lithium aluminum hydride. The alcohol was converted to the bromide with 48 percent hydrobromic acid in the presence of sulfuric acid. The triphenylmethyl and the *p*-chlorobenzyl ethers were prepared from the alcohol while the ethyl ether was obtained from its bromide. Cleavage occurred to give triphenylmethane in a reaction of the triphenylmethyl ether with *n*-butyllithium followed with the addition of mesitoyl chloride. Similar attempted acylation reactions on the preceding alcohol and acid gave a recovery of starting material. Model reactions on 5-bromoacenaphthene showed that utilization of *n*-butyllithium was better than the Grignard reaction as a method for obtaining an organometallic derivative in the acenaphthene series.

Attempts to base the structure proof on 5-bromoacenaphthenone were not carried beyond the unsaturated ester obtained by a Reformatsky reaction on the ketone using methyl bromoacetate and zinc.

A new acenaphthylene was prepared by the method given by Mange (1) for the conversion of 5-mesitoyl-acenaphthene to 5-mesitoylacenaphthalene. Acenaphthene was nitrated to give 5-nitroacenaphthene which was brominated in the *peri*-bridge with *N*-bromosuccinimide. The bromo compound was dehydrobrominated with pyridine to give 5-nitroacenaphthalene.



This compound did not add hydrogen bromide or ethyl malonate under the conditions employed.

#### BIBLIOGRAPHY

1. F. E. Mange, Thesis, Doctor of Philosophy, University of Illinois, 1951.
2. G. Kalopissus and H. Gault, *Compt. rend.*, **231**, 1310 (1950).
3. J. Cason, *Org. Syntheses*, **21**, 1 (1941).
4. H. Gault and G. Kalopissus, *Compt. rend.*, **229**, 624 (1949).
5. V. R. Gaertner, Thesis, Doctor of Philosophy, University of Illinois, 1948.

Microfilm copy of complete manuscript of 85 pages, \$1.06. Enlargements 6" x 8", 10¢ per page. Library of Congress card number MicA54-337.

#### SYNTHETIC APPROACHES TO RADIOCHOLESTEROL

(Publication No. 7044)

Constantine Katsaros, Ph.D.  
Northwestern University, 1953

Cholesterol, labeled in the side chain with radioactive carbon, would be a useful tool for the investigation of steroid metabolism. Such a compound would also be ideally suited for the study of the conversion of cholesterol to bile acids and to adrenal steroids. For these reasons, synthetic routes to cholesterol-21- $c^{14}$  and cholesterol-23- $c^{14}$ , by means of side chain elongation, were investigated.

The starting material for the preparation of cholesterol-21- $c^{14}$  was 3 $\beta$ -hydroxy-5-pregnen-20-one (pregnenolone). This compound was readily degraded to 3 $\beta$ -hydroxy-5-androstene-17 $\beta$ -carboxylic acid, but it was found that acetylation of the 3-hydroxy group of the resulting acid could not be affected in good yield. The use of vigorous conditions resulted in the formation of 3 $\beta$ -acetoxy-5-androstene-17 $\beta$ -carboxylic anhydride, while mild conditions gave mixtures of the 3-hydroxy and 3-acetoxy acids which could not be easily separated.

A base catalyzed condensation of pregnenolone and benzaldehyde yielded 21-benzylidenepregnenolone in good yield. This compound was readily acetylated, but neutral permanganate oxidation of the benzylidene group gave a mixture of 3 $\beta$ -hydroxy and 3 $\beta$ -acetoxy-5-androstene-17 $\beta$ -carboxylic acids, giving rise to the separation difficulties encountered earlier.

It was found that the corresponding 3-benzoxy and 3-methoxy acids could be prepared in moderate overall yields by way of the benzylidene compound, but without the above mentioned separation difficulties. Thus, 3 $\beta$ -methoxy-5-androstene-17 $\beta$ -carboxylic acid was converted, via the reaction of its acid chloride and diisohexyl cadmium, to the desired intermediate, 3 $\beta$ -methoxy-5-androstene-17 $\beta$ -yl isohexyl ketone.

As another means of obtaining this ketone, the preparation of ethyl 3 $\beta$ -methoxy-20-keto-5-pregnene-21-carboxylate was investigated. This compound

could not be prepared by the condensation of pregnenolone with ethyl carbonate using sodium ethoxide or sodium hydride. A small amount was prepared by the pyrolysis of methyl 3 $\beta$ -methoxy-20-keto-5-pregnene-21-glyoxylate. However, the pyrolysis could not be repeated. The corresponding 3-hydroxy glyoxylate was also prepared. Direct alkylation of methyl 3 $\beta$ -methoxy-20-keto-5-pregnene-21-glyoxylate with potassium *t*-butoxide and *i*-amyl bromide yielded a bright blue solid, of unknown structure, and a white solid, presumed to be the 17 epimer of the starting glyoxylate. Alkylation attempts using sodium methoxide yielded pregnenolone directly.

As a test compound, 20-hydroxycholesteryl acetate was prepared by the action of isohexylmagnesium bromide on pregnenolone. This compound could not be reduced to cholesteryl acetate either by direct reduction with phosphorus and iodine, or by dehydration and selective reduction of the double bond formed. These results eliminated the possibility of preparing cholesterol-21- $c^{14}$  by the reaction of methyl- $c^{14}$ -magnesium iodide and 3 $\beta$ -methoxy-5-androstene-17 $\beta$ -yl isohexyl ketone.

3 $\beta$ -Methoxy-5-androstene-17 $\beta$ -yl isohexyl ketone was reduced to 3 $\beta$ -methoxy-5-androstene-17 $\beta$ -ylisohexylcarbinol. The proposed synthesis was to convert this compound to the corresponding halide, the Grignard of which could be reacted with radioactive carbon dioxide, to give a 21- $c^{14}$ -carboxylic acid. Reduction of this acid to a methyl group would give cholesterol-21- $c^{14}$ . However, it was found that the desired halide could not be prepared either from the *p*-toluenesulfonate of 3 $\beta$ -methoxy-5-androstene-17 $\beta$ -ylisohexylcarbinol or by the action of phosphorus tribromide on the carbinol.

As a means of obtaining cholesterol-23- $c^{14}$ , the reduction of the previously prepared 22-*p*-toluenesulfonate-*i*-cholesteryl methyl ether with lithium aluminum hydride was investigated. Reduction of this compound and rearrangement to the normal 3-hydroxy structure yielded only small amounts of material which are believed to be impure samples of cholesterol. These samples could not be purified by chromatography or by preparation and recrystallization of their acetates.

Microfilm copy of complete manuscript of 86 pages, \$1.00. Enlargements 6" x 8", 10¢ per page. Library of Congress card number MicA54-338.

#### A STUDY OF CONJUGATION IN THE BIPHENYL SYSTEM

(Publication No. 6898)

Victor Peter Kreiter, Jr., Ph.D.  
Stanford University, 1953

The dissociation constants of the following compounds were measured in boric acid-borate buffers by means of a spectrophotometric method: 3-hydroxybiphenyl (I), 4-hydroxybiphenyl (II), 4'-nitro-4-hydroxybiphenyl (III), 3'-nitro-4-hydroxybiphenyl (IV), 2-hydroxyfluorene (V), and 2-nitro-7-hydroxyfluorene (VI).



Measurement of the dissociation constant of 3,5-dimethylphenol (VII) was included so that reference to the series of analogously substituted phenols could be made. In the course of the work the spectra of the acid and conjugate base forms of these compounds were determined.

probably in the order of the resonance energy of one benzene ring.

Although conjugation across two benzene rings has been shown to be absent in the ground state of the biphenyls, conjugation in the transition states of electrophilic substitution reactions seems possible. The

Table of Dissociation Constants and Spectral Characteristics

Compound	pK <sub>a</sub>			Spectral Characteristics in Water at 26°			
	19°	26°	38°	Acid Form		Conjugate Base Form	
				λ <sub>max.</sub> (mμ)	ε × 10 <sup>-3</sup>	λ <sub>max.</sub> (mμ)	ε × 10 <sup>-3</sup>
I	—	9.50	—	250	13.7	305	4.13
II	—	9.40	—	260	17.8	287.5	20.1
III	9.07	8.95	8.77	232	12.5	265(a)	12.2
				340	14.2	400	15.1
IV	—	9.14	—	263	24.8	294	23.4
V	—	9.51	—	268	19.9	294	20.8
				300-312(b)	6.1-6.3		
VI	9.08	8.94	8.77	250	9.12	270	12.5
				370	16.7	430	17.6
VII	—	9.98	—	271	1.17	290	2.56
				278	1.17		

(a) In 95% ethanol.

(b) A flat maximum with an indication of fine structure.

The differences between the dissociation constants of these compounds are so small that it is necessary to conclude that there is little or no contribution to the electronic structure of the conjugate base of 4'-nitro-4-hydroxybiphenyl or of 2-nitro-7-hydroxybiphenyl by a contributing form that involves conjugation by means of the resonance effect between the nitro and the hydroxy groups across the two benzene rings. This conclusion is not to be taken to mean that conjugation across the biphenyl system is not possible under any circumstances (the spectra of these compounds show the "resonance bands" that can be attributed to such conjugation), but it does strongly indicate that such conjugation is not possible in the ground state of the biphenyl system.

An explanation for the absence of conjugation is that the energy difference (probably in the order of the resonance energy of two benzene rings) between the quinoidal structure

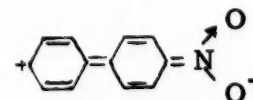


and the Kekule structure

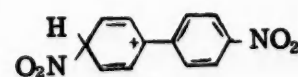


is too large for the quinoidal form to contribute significantly to the resonance hybrid, whereas in *para*-nitrophenol (in which the quinoidal form does contribute significantly to the ground state of the conjugate base) the difference in energy between the quinoidal and the Kekule structures is smaller,

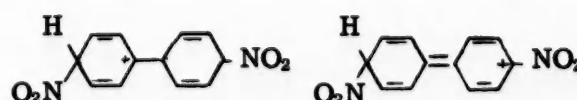
absence of preferential attack of an electrophilic reagent, such as the nitronium ion, at the 3' position of a compound, such as 2- or 4-nitrobiphenyl, can be attributed to the absence of any significant contribution to the structures of these compounds by forms involving conjugation across the biphenyl system, for example:



The exclusive attack at the 2' and the 4' positions of 2- or 4-nitrobiphenyl during nitration is explained by the increase in stability of the transition state brought about by the ability of the positive charge of the transition state to distribute itself over both benzene rings rather than only one as would be the case in 3' substitution. The energy rich quinoidal structure (characteristic of electrophilic aromatic substitutions) that can be considered to first appear when the nitronium ion attaches itself to the first benzene ring



can readily extend itself into the second ring, thereby involving resonance between only one benzene ring and the quinoidal form



The energy difference between these two forms is in the order of the resonance energy of one benzene ring only.

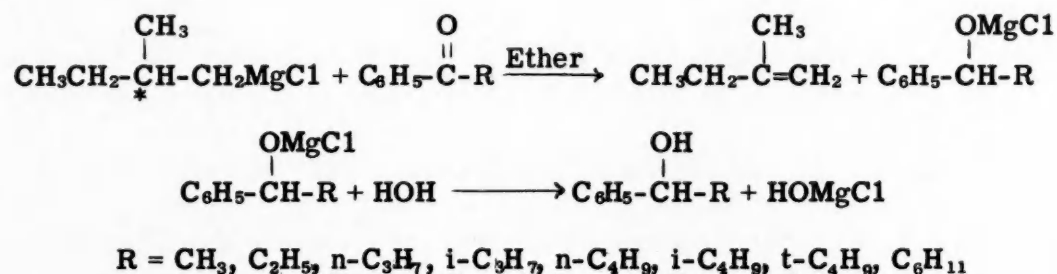
Microfilm copy of complete manuscript of 101 pages, \$1.26. Enlargements 6" x 8", 10¢ per page. Library of Congress card number MicA54-339.

### THE ASYMMETRIC REDUCTION OF ARYL ALKYL KETONES

(Publication No. 6900)

Roderick MacLeod, Ph.D.  
Stanford University, 1953

A study of the asymmetric reducing action of (+)-2-methylbutylmagnesium chloride on eight aryl alkyl ketones was undertaken for the purpose of exploring the effects of a regularly varied series of substituent groups on the course of the asymmetric Grignard reduction reaction.



In each case, a molar excess of the optically active Grignard reagent, prepared from optically pure (+)-1-chloro-2-methylbutane, was added dropwise to a rapidly stirred, gently refluxing solution of the ketone in ether. The products were separated by fractionation at reduced pressures, and the yields of reduction and enolization products, respectively, were confirmed by titrating the excess ether for olefin and by the preparation of 2,4-dinitrophenylhydrazones from samples of the crude products. The purities of the partially active arylalkylcarbinols isolated by fractionation were tested by way of the preparation and hydrolysis of hydrogen phthalates which were purified as oils to avoid changing the molar ratios of the optical isomers.

The partially active secondary carbinols formed by reduction were obtained in yields ranging from thirty-seven to ninety-seven molar percent of the starting materials. The specific optical rotations of the carbinols ranged from approximately four to twenty-five percent of those reported for the pure optical isomers. With the exception of phenyl-i-butylcarbinol, which was resolved in the course of this work, the extents of asymmetric reduction achieved in these reactions were based on what appear to be the best literature values for the optical rotations of the resolved isomers.

The extent of asymmetric reduction was found to increase with the increased length of chain and degree of branching of the substituent alkyl groups. These results were compared with prior data relating

to the asymmetric reducing action of various optically active Grignard reagents and were interpreted according to the theory of a cyclic, complex transition intermediate with two point contact plus interaction described by Mosher\* and La Combe. On the basis of the reduction mechanism, configurations were tentatively assigned to the enantiomorphs produced in excess by reduction. These configurations were compared with those previously assigned on the basis of Freudenberg's displacement rule.

\*Mosher, H. S., and La Combe, E. M., *J. Am. Chem. Soc.*, **72**, 3994 (1950).

Microfilm copy of complete manuscript of 139 pages, \$1.74. Enlargements 6" x 8", 10¢ per page. Library of Congress card number MicA54-340.

### REDUCTIVE COUPLING AND POLYMERIZATION OF UNSATURATED AMIDES

(Publication No. 6973)

Robert Ervin Putnam, Ph.D.  
University of Illinois, 1953

Since its discovery in 1946 by Finholt, Bond and Schlesinger<sup>1</sup> lithium aluminum hydride has been used a number of times for the reduction of functional groups conjugated with carbon-carbon double bonds.<sup>2,3</sup> Reduction of the carbon-carbon double bond is avoided by inverse addition of an ether solution of the hydride. In this laboratory an attempt to apply this method to the reduction of N,N-diethylcinnamamide led, not to the expected diethylcinnamylamine, but to a reductively coupled product, N,N,N',N'-tetraethyl- $\alpha$ -benzyl- $\beta$ -phenylglutaramide.

In order to determine the generality of this unique example of bimolecular reduction the behavior of a series of  $\alpha,\beta$ -unsaturated amides was investigated. The results indicated that the nature of the major product obtained in each case is strongly dependent on the size of groups attached to the amide.

N,N-Diethylacrylamide gave a high molecular weight polymer exclusively. N,N-Diethylcrotonamide gave a mixture of N,N,N',N'-tetraethyl- $\alpha$ -ethyl- $\beta$ -methylglutaramide, a polymer of N,N-diethylcrotonamide and several amines. N,N-Diethyl- $\beta$ -methylcrotonamide gave a 47% yield of N,N-diethylisovaleramide together with N,N,N',N'-tetraethyl- $\alpha$ -isopropyl- $\beta$ -dimethylglutaramide and several'



unidentified amines. N,N-Diethylcinnamamide and N,N-diethylfurylacrylamide yielded, respectively, 52.5 and 53% of reductively coupled product. N-Methyl-N-phenylcinnamamide and cinnamic acid piperidide underwent reductive coupling to a lesser extent than N,N-diethylcinnamamide. In these cases strongly competing side reactions were observed. N,N-Diethyl- $\alpha$ -methylcrotonamide and cinnamamide failed to react under the conditions employed.

The reduction of  $\alpha$ , $\beta$ -unsaturated ketones was also investigated. Benzalacetomesitylene gave 2-phenylethyl mesityl ketone in 60% yield. Benzalpinacolone gave a product which was not investigated further.

Reductive coupling of  $\alpha$ , $\beta$ -unsaturated amides has been shown to be a stereospecific reaction. Thus, N,N-diethylcrotonamide, N,N-diethylcinnamamide, N-methyl-N-phenylcinnamamide and cinnamic acid piperidide each gave only one of the two possible racemic glutaramides.

The structure of N,N,N',N'-tetraethyl- $\alpha$ -ethyl- $\beta$ -methylglutaramide was proved by hydrolysis to  $\alpha$ -ethyl- $\beta$ -methylglutaric acid. This acid was synthesized by the route: ethyl crotonate, diethyl  $\alpha$ -cyano- $\beta$ -methylglutarate, diethyl  $\alpha$ -cyano- $\alpha'$ -ethyl- $\beta$ -methylglutarate,  $\alpha$ -ethyl- $\beta$ -methylglutaric acid.

The reaction of N,N-diethylcinnamamide with sodium borohydride failed to give any product. An attempt to add malonic ester to this amide also failed.

1. Finholt, Bond and Schlesinger, *J. Am. Chem. Soc.*, **69**, 1199 (1947).

2. U. Solms, *Chimia*, **5**, 25 (1951).

3. Brown, *Org. Reactions*, **6**, 469 (1951).

Microfilm copy of complete manuscript of 88 pages, \$1.10. Enlargements 6" x 8", 10¢ per page. Library of Congress card number MicA54-341.

## THE STEREOCHEMISTRY OF 2,5 AND 2,6 DISUBSTITUTED DIOXANES

(Publication No. 7067)

James Regis Stephens, Ph.D.  
Northwestern University, 1953

This work presents the first stereochemical study of polysubstituted dioxanes. It is divided into five sections.

### Section I

The difficulties of assigning configurations to polysubstituted dioxanes by any method are discussed. Principles are formulated by which the problem may be solved by the chemical method. In line with these principles three isomeric iodides, (I), (II), and (III), of formula  $C_8H_{10}O_2I_2$  are singled out to begin a stereochemical study.

Experimental work is then interpreted to show that:

- (I) is one of the four possible isomers of the 2,6 and 2,5-bis(iodomethyl)-p-dioxanes.
- (II) and (III) are the two isomers of 2,6-bis(iodomethyl)-p-dioxane if they can be established as p-dioxanes.

### Section II

The experimental attack of the problem is presented in seven parts.

**Part A.** The preparation, separation, and characteristics of (I), (II), and (III) are discussed along with possible structures for (II) and (III).

**Part B.** The experimental work that failed to give information as to the structures of the above isomers is outlined and interpreted. The inclusion of this part is warranted since some known mercury derivatives of (I) are shown to have been assigned incorrect structures by previous investigators.

**Part C. and D.** (II) and (III) are shown to be geometrical isomers and p-dioxanes by the nitric acid oxidation to p-dioxanedicarboxylic acids and the interconversions of these acids by hot aqueous base. These compounds are formulated as 2,6 disubstituted dioxanes. The configurations of the compounds are shown by the conversion of one of the iodides to morpholine derivatives and the hydrolysis of monomeric 2,6-p-dioxanedicarboxylic anhydride to one of the acids.

From this work it is concluded that (I) has the 2,5-bis(iodomethyl)-p-dioxane structure.

**Part E.** (I) was converted by a sequence of reactions to a 2,5-p-dioxanedicarboxylic acid, (IV). The stereospecificity of this conversion is discussed in detail. It was established that no isomerization occurred in these reactions.

**Part F.** (IV) was converted to its isomer (V) by several methods. The equilibration of (IV) and (V) by the action of hot aqueous base showed that they are geometrical isomers. (V) was partially resolved into optical antipodes and was hence assigned the cis configuration. Several anhydrides of both (IV) and (V) were prepared. The hydrolysis of monomeric 2,5-p-dioxanedicarboxylic anhydride produced (V) confirming its assignment of configuration. (IV) was then formulated as trans 2,5-p-dioxanedicarboxylic acid. This particular assignment permitted the elucidation of the structure and geometry of many compounds including (I) and some glycerine ethers of previously unknown structure.

**Part G.** By the same sequence of reagents on both (IV) and (V), (IV) was converted back to (I), and (V) was converted to cis 2,5-bis(iodomethyl)-p-dioxane, the long sought geometrical isomer of (I).

### Section III

The assignment of structures and configurations to all compounds encountered in this work with a graphic summary of the chemical reactions are given. The compounds are thirty three in number, of which eight were previously described but were of unknown structure.

## Section IV

Generalizations of the chemistry presented are given. It is pointed out that in any pair of isomerides encountered in this work the *cis* 2,6 and the *trans* 2,5 isomers are the higher melting forms. This behavior is shown to be similar to that of the corresponding cyclohexane derivatives. It is concluded that the polar-equatorial substitution theory applied to cyclohexane derivatives is applicable to the disubstituted dioxanes. A new visualization of the dioxane ring is presented.

## Section V

The details of the experiments carried out to provide the authority for the assignment of structures and configurations to all the compounds encountered in this work are given.

Microfilm copy of complete manuscript of 113 pages, \$1.41. Enlargements 6" x 8", 10¢ per page. Library of Congress card number MicA54-342.

# RESTRICTED ROTATION IN DERIVATIVES OF 2-METHYL-1-NAPHTHYLAMINE

(Publication No. 6986)

Karl Viktor Yngve Sundström, Ph.D.  
University of Illinois, 1953

## Introduction

Several instances are known, in which *N,N*-disubstituted aromatic amines with ring substituents ortho to the nitrogen show optical isomerism due to restriction of the free rotation around the carbon-nitrogen bond (1). It has been shown that factors other than the mere bulk of the hindering substituents influence the stability of the optically active isomers as measured by the half-life of the optical activity on heating in solution. The objective of this work was to gain information on the effect on the configurational stability of substituents para to the pivot-bond nitrogen in *N*-benzenesulfonyl-*N*-carboxymethyl-2-methyl-1-naphthylamine.

## Discussion of Results

Ten compounds, three of which have been described previously (2), were synthesized and resolved. The half-lives of optical activity in dimethyl formamide solution at the temperature of boiling *n*-butanol were determined and were found to depend on the para-substituent thus: Nitro, forty-two hundredths hour; chloro (2), three and seven-tenths hours; bromo (2), three and eight-tenths hours; iodo, four and four-tenths hours; none (2), four and nine-tenths hours; benzenesulfonamide, three and eight-tenths hours; benzamido, five and nine-tenths hours; acetamido, five hours; hydroxy, eight and seven-tenths hours; amino, nine and seven-tenths hours.

The sterically hindered part of the molecule is the same in all these compounds. The half-lives are therefore measurements of the electronic effect of the various substituents on the stability of the given optically active system.

The racemization of compounds, whose optical activity is due to restricted rotation, probably proceeds through a symmetrical, planar configuration. In such a planar state, resonance interaction between the substituted amine nitrogen and the nucleus may be enhanced or decreased, depending on the electronic nature of the para-substituent. An electron withdrawing group in the para-position, as illustrated by the nitro, makes this coplanar structure increasingly important, thus the racemization becomes more rapid. Electron supplying substituents such as the hydroxy and the amine groups slow down the rate of racemization, since they have less tendency to lower the energy of the transition state through resonance.

## BIBLIOGRAPHY

1. R. Adams et al., *J. Am. Chem. Soc.* **62**, 2191 (1940); **63**, 2859 (1941); **64**, 1475 (1942); **70**, 2667 (1948); **72**, 2458, 4606 (1950).
2. R. H. Mattson, Thesis, Doctor of Philosophy, University of Illinois, 1950.

Microfilm copy of complete manuscript of 94 pages, \$1.18. Enlargements 6" x 8", 10¢ per page. Library of Congress card number MicA54-343

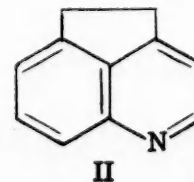
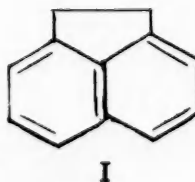
## THE ACEQUINOLINE NUCLEUS

(Publication No. 6991)

Thomas Mabry Veazey, Ph.D.  
University of Illinois, 1953

## Introduction

No derivative of quinoline is known which contains the *peri* bridge that is characteristic of acenaphthene (I). The simplest member of such a series would have the structure represented by formula II, for which the name "acequinoline" is suggested. The present investigation was an experimental evaluation of possible approaches to this difficultly accessible three-ring system.



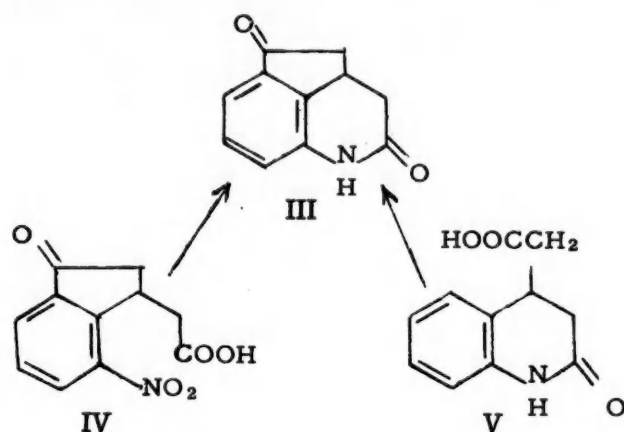
## Discussion

The basic ring system was attained by two alternate routes, thus affording unequivocal proof of the ring structure obtained. In the initial synthesis, the heterocyclic ring was closed first to give the known compound, hydrocarbostyryl-4-acetic acid. The final closure of the five-membered ring to achieve the tricyclic compound (III) was accomplished by subjection of the acid (V) to the Friedel-Crafts reaction.

In the second method, the final closure of the heterocyclic ring to obtain the same tricyclic compound (III) was achieved by a reductive cyclization



of 4-nitroindan-1-one-3-acetic acid (IV), in which the five-membered ring is already intact.



Several oxygen-substituted hydro-derivatives of this parent nucleus (II) were prepared in such a manner that there is little doubt as to their structures.

In the course of the present work, the method of Manske was expanded to include kilogram-scale synthesis of  $\beta$ -phenylglutaric acid.<sup>1</sup> The study by Schroeter and Meerwein on the nitration of this acid was corroborated in detail and was extended to the use of acetyl nitrate as the nitrating reagent.<sup>2</sup>

The acetyl nitrate reaction was found to increase the yield of the *meta* and *para* isomers at the expense of the *ortho* isomer, contrary to the usual result of nitration by this reagent.

The preparation of both the *meta* and *para* nitro derivatives of  $\beta$ -phenylglutaric acid by the condensation of the corresponding nitrobenzaldehydes with ethyl acetoacetate, and treatment of the resulting condensates with hot concentrated alkali is reported by Hey and Kohn,<sup>3</sup> who also found that these acids would not undergo Friedel-Crafts ring closure. In the present study, it was found to be impossible to prepare the *ortho* nitro acid by this method, but the acid, prepared by direct nitration, was shown to undergo Friedel-Crafts ring closure without difficulty.

The oxygen atom on the five-membered ring of the keto-amide (III), which was not removed by various catalytic reduction procedures, was eventually removed by both the Wolff-Kishner method and the Clemmensen method. In an investigation of the catalytic hydrogenation of this compound (III), it was discovered that low pressure hydrogenation in ethanol solution would reduce the keto group to an alcohol, but when this alcohol was then subjected to high pressure hydrogenation in acetic acid solution, the hydroxy group was reoxidized to the keto group.

1. R. H. Manske, J. Am. Chem. Soc., **53**, 1104 (1931).

2. G. Schroeter and H. Meerwein, Ber., **35**, 2073 (1902), **36**, 2670 (1903), **40**, 1586 (1907).

3. D. H. Hey and D. H. Kohn, J. Chem. Soc., 3177 (1949).

Microfilm copy of complete manuscript of 59 pages, \$1.00. Enlargements 6" x 8", 10¢ per page. Library of Congress card number MicA54-344.

## THE INSECTICIDAL PRINCIPLES OF HAPLOPHYTON CIMICIDUM

(Publication No. 6996)

John Frederick Walker, Ph.D.  
University of Illinois, 1953

Many species of plant life manufacture physiological active materials which frequently can be extracted from the plant by the use of suitable solvents. *Haplophyton camicidum*, a member of the family Apocynaceae, has been known for many years to contain materials which are insecticidally active and considerable work has been done on the extraction, isolation and characterization of these insecticidal materials (1,2). The present work is a continuation of previous research on the insecticidally active principles present in *H. Camicidum*.

Two insecticidal alkaloids, haplophytine and cimicidine, were previously isolated from the ground plant (1) in yields of 0.034% and 0.003% respectively. When more mature plant was used for the extraction the yields were drastically reduced. An improvement in the method of isolation of haplophytine was achieved whereby the alkaloid was obtained in 0.01% yield versus the 0.004% yield by the previous method. Extraction of the ground plant was also performed on a larger, more efficient scale in a Brighton solid-liquid extractor. Haplophytine and cimicidine were isolated from these extractions in yields of 0.01% and 0.003% respectively. A new insecticidal compound, insecticide III, which is in the same range of insecticidal activity as haplophytine, was isolated from the plant in low yield. Insecticide III contained only the elements carbon, hydrogen and oxygen; it had at least one hydroxyl group, no carbonyl groups and no easily oxidizable double bonds. Its probable formula is some multiple of  $C_{10}H_{14}O_2$  or  $C_9H_{12}O_2$ .

Chemical investigations of haplophytine and cimicidine were concerned mainly with the nature of the functional groups of the alkaloids and their derivatives. Reduction of haplophytine and cimicidine with sodium borohydride indicated the possible presence of at least one ketone group in both alkaloids; spectral evidence favored a small-membered ring ketone. The ketone group of haplophytine, if present, was inert to such reagents as benzyl mercaptan, hydroxylamine, phenylhydrazine and malonic acid. The expected activating influence of the ketone carbonyl group was not detected; such reagents as formaldehyde, benzaldehyde, formaldehyde and piperidine, and selenium dioxide failed to react with haplophytine.

The permanganate oxidation of haplophytine was investigated and it was concluded from spectral and chemical evidence that the oxidation product was not an acid anhydride as had been proposed (2) and that the oxidation reaction probably produced either a carboxylic acid or a ketone.

Haplophytine was found to react with cyanogen bromide to give a basic and a neutral product. Cimicidine was not attacked by cyanogen bromide. One of the nitrogen atoms of haplophytine reacted with sulfur dioxide to give a yellow addition product.

Attempts were made to degrade the alkaloids by oxidation, hydrolysis and dehydrogenation. Both haplophytine and acetylated haplophytine yielded the same product on oxidation with alkaline hydrogen peroxide. Further oxidation of this product with alkaline hydrogen peroxide did not yield a characterizable derivative. Alkaline hydrogen peroxide did not attack the permanganate oxidation product of haplophytine. Haplophytine was susceptible to hydrolysis with barium hydroxide or sulfurous acid but the apparently acidic products could not be obtained in a pure state due to their high water solubility. Hydrolysis of cimicidine with sulfurous acid yielded a crystalline product which could not be characterized due to its instability. At 285° haplophytine could not be catalytically dehydrogenated while at 300° the only pure product isolated was a small amount of haplophytine itself.

#### REFERENCES

- (1) E. F. Rogers, H. R. Snyder and R. F. Fischer, *J. Am. Chem. Soc.*, **74**, 1987 (1952).
- (2) R. F. Fischer, Ph.D. thesis, University of Illinois, 1950.

Microfilm copy of complete manuscript of 76 pages, \$1.00. Enlargements 6" x 8", 10¢ per page. Library of Congress card number MicA54-345.

#### I. COPOLYMERIZATION OF BUTADIENE WITH MYRCENE. II. COPOLYMERIZATION OF BUTADIENE WITH SUBSTITUTED ALKYL ACRYLATES.

(Publication No. 6999)

Barbara Joy Hummel Weil, Ph.D.  
University of Illinois, 1953

#### PART I

The copolymerization with butadiene of myrcene, 2-methyl-6-methylene-2,7-octadiene, was studied to determine proper conditions for the production of butadiene/myrcene copolymers of varying ratios and to obtain physical evaluation of some of these copolymers after compounding and vulcanization.

It was found that the use of even slightly impure myrcene in the recipe had a deleterious effect on the properties of the resultant polymers, especially their solubilities in benzene and inherent viscosities.

Copolymerizations with butadiene in the mutual recipe at 30° and 50° were carried out in which the myrcene charge was varied from 5 to 75 percent. As the percentage of myrcene charged was increased, the rate of conversion, the solubilities of the copolymers in benzene and their viscosities steadily decreased. Polymerization in the mutual recipe at 30° by tumbling the samples for 72 hours yielded the best and most reproducible copolymers. Polymerization in the cumene hydroperoxide recipe at 0° produced soft, insoluble polymers and inconsistent results with respect to conversions.

Infrared analysis and ozonization of 95/5 and 90/10 butadiene/myrcene copolymers served only as qualitative indications that myrcene unit was present.

Physical evaluation of 95/5 and 90/10 butadiene/myrcene copolymers showed that they were similar in most respects to polybutadiene and therefore were not very promising for further investigation.

The three-monomer system of myrcene, styrene and butadiene produced polymers of decreasing solubilities in benzene and lowered inherent viscosities as the myrcene content was increased and the styrene content decreased.

#### PART II

Five esters, 1-cyanoethyl, 2-cyanoethyl, cyanomethyl, 2-cyano-2-propyl and 2-hydroxyethyl acrylates, were synthesized and copolymerized with butadiene. The cumene hydroperoxide recipe was used for the copolymerizations of four of the esters and the mutual recipe was used for the copolymerizations involving the cyanopropyl ester. The presence of about 10 percent of one of these esters in the monomers charge increased the rate of polymerization over that of butadiene alone in every case.

1-Cyanoethyl acrylate, selected as representative of the other cyanoalkyl esters, was investigated extensively. Studies to determine the effect of monomer ratio on solubilities of the resulting copolymers, the amount of acrylate incorporated in the polymers and the extent of conversion versus time of tumbling and acrylate incorporation were carried out. It was demonstrated that a true copolymer was formed rather than a mixture of polymers.

It was also shown that at least for 90/10 and 85/15 butadiene/1-cyanoethyl acrylate charges, all of the acrylate charged was incorporated into the polymers.

Three samples of 90/10 butadiene/acrylate copolymers were prepared for physical evaluation in which the esters were 1-cyanoethyl, cyanomethyl and 2-cyano-2-propyl acrylates. The copolymer of butadiene/1-cyanoethyl acrylate was high viscosity material and produced a vulcanizate with exceptionally good tensile strength and oil-resistance properties; the latter was determined both at room temperature and elevated temperatures. Results of evaluation of the other copolymers have not yet been received.

Homopolymerization of 1-cyanoethyl acrylate in solution produced tough, resinous polymers in soluble in organic solvents.

Microfilm copy of complete manuscript of 124 pages, \$1.55. Enlargements 6" x 8", 10¢ per page. Library of Congress card number MicA54-346.



## CHEMISTRY, PHYSICAL

MECHANISM OF AQUATION  
OF SOME COBALT (III) COMPLEXES

(Publication No. 7016)

Charles Ray Boston, Ph.D.  
Northwestern University, 1953Supervisors: Professors Ralph G. Pearson and  
Fred Basolo

Complex ions are in general capable of undergoing a number of relatively slow reactions in solution whereby a group (acido group or neutral molecule) is removed from the coordination sphere and replaced by another from the surrounding medium. Probably the most important of these substitution reactions is that of aquation in which the acido group is replaced by a water molecule. The purpose of this investigation was to gain information relevant to the elucidation of the mechanism of aquation.

The more direct approaches (e. g. kinetic and stereochemical) to the problem of determining reaction mechanisms have not as yet been too successful when applied to the reactions of coordination compounds. For this reason, the indirect approach of determining the effect of structure on reaction rate was employed in this study.

Rates of aquation were measured for several series of cobalt (III) complexes and the structure of the unreactive portion of the complex was systematically varied in each series. The structural variations were of two general types: (1) those involving a change in the steric properties of the bidentate (AA) group in a series of compounds of the type, *trans*  $[\text{Co}(\text{AA})_2\text{Cl}_2]^+$  and, (2) those involving an increase in the number of chelate rings in complexes of the type, *cis*  $[\text{Coa}_4\text{Cl}_2]^+$  and  $[\text{Coa}_5\text{Cl}]^{+2}$ .

The steric properties of the unreactive portion of the complex have been shown to have a very definite influence on the rate of aquation. In particular, when the nature of the structural change was such that it affected only the steric properties of the unreactive portion of the complex, it was observed that an increase in size or steric crowding resulted in an increase in the rate of aquation. This has been interpreted as evidence for the five coordinated intermediate of the  $\text{SN}_1$  mechanism and against the seven coordinated activated complex of the  $\text{SN}_2$  or displacement mechanism.

It has been further shown that solvation factors may influence the rate of aquation. This was indicated when a decrease in the total number of acidic hydrogens in the complex resulted in a decrease in the rate of aquation.

Microfilm copy of complete manuscript of 68 pages, \$1.00. Enlargements 6" x 8", 10¢ per page. Library of Congress card number MicA54-347.

DIFFUSION IN SOLUTIONS CONTAINING  
GLUCOSE AND SUCROSE

(Publication No. 7023)

David M. Clarke, Ph.D.  
Northwestern University, 1953

The theory of diffusion processes has been investigated and the significance of a diffusion coefficient for mixtures stated. The meanings of average diffusion coefficients have been shown.

Diffusion experiments on three types of systems containing glucose, sucrose and water have been carried out. Limiting concentration runs, i.e. measurements on solutions one of which contains glucose, sucrose and water, and the other only glucose and water, have been done in groups at 30%, 50%, 60% and 71% glucose by weight. One experiment was done at 5% glucose. From these, the effect of glucose upon the diffusion of sucrose has been ascertained and expressed as a diffusion interaction coefficient. The interaction increases markedly with increasing glucose concentration.

Through experiments using solutions with equal activities of water, it has been shown that though the water may be the agent responsible for carrying out the diffusion, the water gradient does not greatly affect the individual diffusion coefficients of the glucose and sucrose.

In the case of mixtures, it has been shown that the value for the activation energy for diffusion is between that of the components, but that the components themselves have approximately the same activation energy as in their own solutions.

Microfilm copy of complete manuscript of 135 pages, \$1.69. Enlargements 6" x 8", 10¢ per page. Library of Congress card number MicA54-348.

## NUCLEATION IN SUPERSATURATED VAPORS

(Publication No. 6927)

John Victor Clarke, Jr., Ph.D.  
University of Illinois, 1953

In order to obtain reliable experimental data concerning spontaneous nucleation, the critical supersaturation points in mercury vapor, benzene vapor and water vapor were determined. The experimental results were compared with those predicted by the Rodebush equation.

The degree of supersaturation which caused condensation in each case was determined by supercooling a mixture of the vapor and helium by means of an adiabatic expansion.

A sensitive double beam ultraviolet photometer was used to follow the concentration of mercury vapor during expansion. With this device it was determined that no condensation occurred at supersaturations of 100 to 1000 fold at  $-20^\circ\text{C}$ . Using a visual detection cloud chamber which allowed heated mercury vapor to expand into a cooler area, the critical

supersaturation was found to be approximately  $10^4$  fold near  $-20^\circ\text{C}$ . Insertion of the surface tension value for liquid mercury in the Rodebush equation gave a calculated supersaturation of  $10^6$  fold and a critical cluster size of ten atoms.

Using a visual detection cloud chamber, containing the liquid whose vapor was under investigation, the effect of impurities in the liquid was determined. Mannitol at concentrations up to 1.0 M had no apparent effect on condensation. Glycerol at 0.0001 M reduced the critical point from the 7 fold value for pure water to 5 fold. Sodium chloride at 0.001 M had no effect while 1.0 M NaCl raised the critical point to 9 fold.

Benzene was found to have a critical supersaturation of about 8 fold near  $-25^\circ\text{C}$ . This compares to a value of 8.3 fold and a critical cluster size of about forty atoms predicted by the Rodebush equation.

Evidently the bulk surface tension values apply to clusters consisting of approximately forty atoms in the case of benzene to 100 atoms in the case of water but do not hold for cluster sizes in the range of ten atoms. Calculation shows that insertion of a surface tension value of 300 dynes/cc. causes the Rodebush equation to agree with the experimental results for mercury vapor.

The 7 fold critical supersaturation found for pure water vapor in helium was well above the accepted value of 4.8 fold for spontaneous nucleation in air supposedly cleared of ions by an electric field. Since the decrease in the number of naturally occurring ions in helium raised the critical point, the 4.8 fold figure is evidently not a value for spontaneous nucleation but applies to the formation of water droplets on ions.

Microfilm copy of complete manuscript of 87 pages, \$1.09. Enlargements 6" x 8", 10¢ per page. Library of Congress card number MicA54-349.

**A MULTIPLE SHEARED-BOUNDARY  
SEPARATION CELL AND ROTOR FOR  
THE ULTRACENTRIFUGE: A STUDY  
OF SEDIMENTATION IN CELLS  
OF CYLINDRICAL SHAPE**

(Publication No. 6933)

Wallace Ray Deason, Ph.D.  
University of Illinois, 1953

There are many instances where the opaque, separation type ultracentrifuge cell is more useful for the determination of sedimentation constants than the optical analytical ultracentrifuge cell. The optical cell, which employs either refractive index or light absorption methods to follow sedimenting boundaries, is insensitive for solutions of low concentrations and the data in all cases is influenced by the diffusion taking place at the sedimenting boundary.

Sedimentation constants calculated from separation cell data make use of the concentration changes that occur during the run within one or more portions

of the centrifuge cell, or else the amount of material transferred across specified boundary planes. The accuracy of the results obtained depends upon the quantitative analysis and upon the accuracy to which the sedimentation can be theoretically interpreted. All experimental results were calculated assuming two theories of sedimentation in cylindrical cells in order to determine which theory was most applicable. (1) True sector or radial sedimentation. (2) Radial sedimentation to the extent that a particle sedimenting to the wall then sediments along the wall with a component of its radial velocity which is proportional to the angle between the wall and the particles radial direction of travel, or parallel wall sedimentation. The theoretical treatments of both of these cases have been unified and critically examined. Equations have been derived for the calculation of sedimentation constants from data obtained in a multiple-boundary separation cell.

A novel type of separation cell of cylindrical shape was designed. Called a multiple sheared-boundary cell, it consisted of five sections which would automatically shear into alignment as the rotor gained speed and then would automatically shear into disalignment as the rotor slowed down. Five fractions, of 0.5 to 1.0 ml. each, of the solution in the cell thus became available for analysis. The great advantage was that no intermixing of fractions could take place and for the first time a study of the concentrations produced along a column of solution by a centrifugal field could be directly measured. The multiple-boundary separation cell and accompanying rotor (which held four of the cells) were constructed and their operating characteristics investigated.

Experimental data were presented on the sedimentation of edestin, bovine plasma albumin, polystyrene latex, and colloidal silica in the multiple-boundary cell. Data were also given on the sedimentation behavior of bovine plasma albumin in the Tiselius-type sector separation cell. For purposes of comparison the sedimentation rates of the various materials in the optical sector cell were determined.

The sedimentation constants of the proteins calculated from the data of the multiple-boundary cell agreed within experimental error with that obtained in the optical sector cell. The sedimentation constants of the latex and silica sols increased in a consistent manner with the distance of the separation plane from the center of rotation. The values calculated for the two middle planes agreed within experimental error with the optical results while the values for the top and bottom separation planes were as much as 25% low and high, respectively.

The interpretation of the experimental results obtained with the latex and silica sols was expanded to take into account the effects of side-wall sedimentation. Equations were derived for the calculation of the number of particles sedimenting to the wall of a cylindrical cell as radial sedimentation took place. It was concluded that these sols sedimented by radial motion and the particles which hit the wall slid to the bottom of the cell. Convection was not found to occur. However, the results could not be corrected completely for side-wall effects and, therefore, there is apparently an additional small factor as yet unknown.



Microfilm copy of complete manuscript of 142 pages, \$1.78. Enlargements 6" x 8", 10¢ per page. Library of Congress card number MicA54-350.

A MAGNETIC STUDY  
OF POLYMERIZATION RETARDATION

(Publication No. 6819)

Judson L. Ihrig, Ph.D.  
Princeton University, 1952

Retardation of vinyl polymerization is brought about by certain well-defined classes of substances. These classes are: oxygen and other stable free radicals, iodine, quinones, aromatic primary and secondary amines, aromatic nitro compounds, and certain polyhydric phenols. Although no direct experimental evidence has been available, it is almost universally accepted that the primary step in retardation by quinones or nitro compounds is the formation of a resonance-stabilized free radical, by interaction of a retarder molecule and a growing chain. This new species is thought to be too stable to propagate the polymer chain. The new radical is presumed to disappear by stopping other chains, by interacting with another of its kind, or by copolymerizing under certain circumstances. The present research was initiated in hopes of confirming this stabilized radical theory of retardation. Magnetic susceptibility measurements are considered the most reliable method for the determination of free radicals, provided their concentration is high enough. The available evidence has indicated that free radicals in retarded polymerizing systems might be detected.

A sensitive magnetic balance utilizing a bifilar suspension and a permanent magnet is described. Details of sample preparation and technique of susceptibility measurement are given.

The diamagnetic susceptibility of a polymerizing methyl methacrylate mixture initiated by benzoyl peroxide and retarded by quinone is found to be initially lower than the same mixture without retarder present. As the polymerization proceeds, the difference in susceptibilities decreases. Calculations of stabilized radical concentrations indicate a maximum concentration of about  $10^{-3}$  M. The same systems retarded by amines, nitro compounds, or hydroquinone show no initial susceptibility difference between the retarded and the non-retarded polymerizing mixtures.

Conclusions drawn from the experimental results give evidence for: (a) the formation of stabilized radicals in quinone-retarded polymerizations in concentrations much above that of the chain carriers; (b) the formation of these radicals before the polymer chain has grown to a length of more than five monomer units; (c) the absence of appreciable concentration of stabilized radicals formed by direct interaction of quinone molecules and initiator fragments; (d) the operation of a different retarding mechanism in systems containing an amine, nitro compound, or hydroquinone.

Microfilm copy of complete manuscript of 92 pages, \$1.15. Enlargements 6" x 8", 10¢ per page. Library of Congress card number MicA54-351.

PHOTOELECTRIC AND SURFACE POTENTIAL  
STUDIES OF REACTIONS OF ATOMS  
AND RADICALS WITH SOLID SURFACES

(Publication No. 6823)

Brian Mead, Jr., Ph.D.  
Princeton University, 1952

The reactions of atoms and free radicals with solid surfaces have been studied from two viewpoints. (1) The reaction of hydrogen atoms with cuprous oxide has been studied in order to develop a new chemical method for determining hydrogen atom concentrations. (2) The reactions of atoms and radicals with mirrors have been studied by measuring changes in surface potential. Let us discuss these in turn.

A new tool, involving the reduction of cuprous oxide photocells, was developed for the determination of hydrogen atom concentrations in a gas phase flow system. An apparatus is described in which the photovoltaic effect of such a cell can be measured as the cell is bombarded with atomic hydrogen. It was found that by using cells cut from adjacent portions of the same oxidized copper strip, the data were reproducible to about 5%, both as to the original activity and the rate of degradation. It was found that the cells, once reduced by the hydrogen, could be regenerated to their original activity, with an error of about 5%, by the action of  $N_2O$  at  $500^\circ C$ . The sensitivity of this new tool has been compared with calorimetric (recombination upon a tungsten filament) and colorimetric (blueing of  $MoO_3$ ) methods for measurement of hydrogen atom concentrations. The photocell method was found to be better suited to quantitative measurements than the  $MoO_3$  colorimetric method, and more sensitive to low hydrogen atom concentrations than the calorimetric method.

The reactions of atomic hydrogen with mirrors of As, Sb, and Sn have been studied by the measurement of changes in the surface potential representing the removal of these mirrors. A new type of apparatus was designed for the measurement of the surface potential of the mirrors in a flow system by the vibrating-plate condenser method. This method is particularly valuable since measurements of the condition of the surface can be made without affecting the surface. The mirrors were plated upon a stationary platinum electrode, and their potential relative to a vibrating silver electrode was measured as a function of the time of bombardment with hydrogen atoms. The surface potential was studied as a function of the thickness of a metallic mirror. It was found that below 700 atoms thick the surface potential decreased as the thickness decreased. By observing the rates of removal of the various mirrors under the same bombardment with hydrogen atoms, the efficiencies of the reactions have been calculated, and are given on the following page. These reactions were also studied at  $60^\circ C$  by heating both the mirrors and the atomic

hydrogen. The efficiencies of these reactions were calculated at 60° C. In the interval of 25° - 60° C the following apparent activation energies were found for the reactions of atomic hydrogen with the mirrors:

Sb : 17 Kcal., As : 20 Kcal., Sn : 14 Kcal.

These results are discussed in terms of changes in the accommodation coefficient for the metal surfaces.

The reactions of methyl radicals (formed by the photolysis of acetone) with mirrors of As, Sb, and Sn were also studied through changes in surface potentials. Since these reactions are inhibited by small quantities of oxygen, it was found necessary to start the runs with hydrogen atoms. When the adsorbed oxygen was removed, the runs were continued with methyl radicals.

The efficiencies of the reactions of hydrogen atoms and methyl radicals with the three mirrors were found to be as follows: with Sb, As, and Sn at 25° C for H· 4.9, 3.2, and 2.3% respectively; at 60° C for H· 103, 103, and 27.7% respectively; and at 25° C for CH<sub>3</sub>· 36, 81, and 32% respectively.

Microfilm copy of complete manuscript of 111 pages, \$1.39. Enlargements 6" x 8", 10¢ per page. Library of Congress card number MicA54-352.

#### CHEMICAL PROBLEMS IN RADIOFREQUENCY SPECTROSCOPY

(Publication No. 6967)

David Warren McCall, Ph.D.  
University of Illinois, 1953

Nuclei which have spins of one or greater have electric quadrupole moments. These moments are nuclear constants which are associated with the interaction of the nuclei with electric field gradients. The interaction is such that the energy of a nucleus depends upon the angle between the field gradient axis and the nuclear spin axis as well as the magnitudes of the field gradient and the nuclear quadrupole moment. When the problem is treated quantum mechanically definite energy levels result. For a nuclear spin of three halves the energy levels are given by

$$E_m = (e^2 Q q) (1 + \eta/2/3)^{1/2} (3m^2 - 5/4), \quad m = \pm 3/2, \pm 1/2,$$

where  $e$  is the protonic charge,  $Q$  the nuclear quadrupole moment,  $q \equiv V_{zz}/e$ , and  $\eta \equiv (V_{xx} - V_{yy})/V_{zz}$ .  $V_{zz}$ ,  $V_{xx}$ , and  $V_{yy}$  are the second derivatives of the electric potential at the nucleus in a "principal coordinate system." Transitions between these energy levels are possible and the frequency of the associated radiation is given by

$$\nu = (e^2 Q q / 2h) (1 + \eta/2/3)^{1/2}.$$

$q$  and  $\eta$  are determined by extranuclear charges so measurement of  $\nu$  provides information regarding the electronic structure of the molecule. It is predicted theoretically and found experimentally that the frequency is reduced by increasing ionic character,  $s$ -hybridization, and double bond character.

In the present investigation nuclear quadrupole transitions were observed for Cl<sup>35</sup> and Cl<sup>37</sup> nuclei. Both species have three halves spin and the frequency range in which the transitions occur is from five to fifty megacycles. A superregenerative oscillator was used to observe the lines.

These transitions can only be observed in the solid state in resonance experiments but the quadrupole coupling can also be determined from the hyperfine structure of microwave spectra.

In these experiments chlorine resonances were found in twelve compounds for which values have not been previously reported. The frequencies are of chemical significance. For example, the frequency in benzoyl chloride was found to be the lowest yet discovered for a chlorine attached to a carbon atom. This suggests an unusually high ionic character for the bond and is consistent with the high chemical activity of acid chlorides.

Temperature dependences of the resonance frequencies were determined in several compounds and the results compared with the theory of Bayer. In Bayer's theory the temperature dependence is attributed to torsional vibrations of the molecules which tend to lower the average value of the electric field gradient experienced by the nuclei. As the amplitudes of the vibrations increase the average field gradients decrease and the resonance frequency is reduced. The theory fits the experimental data fairly well in the compounds investigated except at high temperatures. The failure in the high temperature region is due to the assumption of the theory that the vibrations are harmonic. While this approximation is good in the lower vibrational levels it is rather poor for the higher vibrational states and results in underestimating the temperature dependence at high temperatures.

In studying temperature dependences it was found that the resonance lines in certain compounds disappear below the melting points. Such behavior is interpreted as evidence for molecular motion in the solid state.

Molecular motion could affect the intensities of the resonance lines in two ways. Uncertainty broadening could arise if the lifetimes of the nuclear states were too severely limited by the motion. Also, if the motion were uneven, as in quick jumps, the excess population in the lower levels would be lost and the resonance would decrease in intensity without broadening. The latter view is adopted as the lines do not appear to broaden.

Microfilm copy of complete manuscript of 92 pages, \$1.15. Enlargements 6" x 8", 10¢ per page. Library of Congress card number MicA54-353.



APPLICATIONS OF ULTRAVIOLET  
SPECTROPHOTOMETRY: I. THE DETERMINATION  
OF THEOBROMINE AND CAFFEINE  
IN CACAO PRODUCTS.

II. SPECTROPHOTOMETRIC TITRATIONS.

(Publication No. 6969)

James William Miles, Ph.D.  
University of Illinois, 1953

PART I

The determination of theobromine and caffeine in commercial cocoa powders by gravimetric or volumetric methods requires the use of relatively large samples (2.5 to 10 grams) since these alkaloids are present in relatively small amounts (0.1 to 3.0 per cent) and good micro methods are not available. In addition, these alkaloids are not appreciably soluble in water or organic solvents and existing methods require the use of large volumes of solvent and often lengthy evaporation steps. Because of its extreme sensitivity, the spectrophotometric method permits the use of much smaller samples (0.2 to 1.0 gram) without sacrificing accuracy. The purpose of this investigation was to develop methods of extraction and isolation of the cocoa alkaloids which could be adapted to determination by a spectrophotometric method.

It was found that accurate and reproducible results for theobromine could be obtained by extracting 0.2 to 0.3 gram samples of cocoa powder by the batch extraction method of Dekker (1) followed by clarification with zinc ferrocyanide as proposed by Moir and Hinks (3) and isolation of the theobromine by adsorption on Fuller's earth columns similar to those used by Moores and Campbell (4). The spectrophotometric determination was made on acidified solutions obtained by elution of the theobromine from the column by sodium hydroxide.

The caffeine was determined using approximately one gram samples by aqueous extraction and zinc ferrocyanide clarification as for the theobromine. The caffeine was isolated by liquid-liquid extraction of the zinc ferrocyanide filtrate with chloroform after making the solution basic with ammonium hydroxide. The spectrophotometric determination was made on the chloroform extracts.

In both determinations a considerable saving in time and manipulation resulted from the use of smaller samples which were more easily extracted.

PART II

The high absorbance of the dichromate ion along with its oxidizing properties suggested that it may be used for the spectrophotometric titration of certain reducing agents in cases where difficulty was experienced with end point detection by indicator methods. A titration cell was constructed from quartz similar to a glass cell described earlier by Goddu and Hume (2). This cell was used in conjunction with a Beckman, model DU, spectrophotometer.

Spectrophotometric titrations of iron with dichromate were carried out at 350 mμ. Interference

from ferric ion was prevented by adding phosphoric acid as a complexing agent. Samples containing from 3 to 30 mg. of iron were determined with an accuracy of  $\pm 0.31\%$ . In a similar manner, dichromate was titrated with ferrous sulfate at 310 mμ using the absorbance of the complexed ferric ion to follow the titration. Samples containing from 0.08 to 0.17 mg. of chromium were determined with an accuracy of  $\pm 0.36\%$ .

A method for the simultaneous determination of mixtures of chromium and vanadium was developed. This involved the spectrophotometric titration of dichromate with arsenious acid, which did not reduce the vanadate, followed by titration of the vanadate in the same solution with ferrous sulfate. Solutions containing from 1.7 to 17.0 mg. of chromium and 2.4 to 4.8 mg. of vanadium were analyzed with an average error of  $\pm 0.44\%$  for chromium and  $\pm 0.62\%$  for vanadium. The method was applied to alloy steel samples with good results.

BIBLIOGRAPHY

1. Dekker, M. J., *Rec. trav. chim.*, **22**, 143-52 (1903).
2. Goddu, Robert F., and Hume, David N., *Anal. Chem.*, **22**, 1314-17 (1950).
3. Moir, D. D., and Hinks, E., *Analyst*, **60**, 439-47 (1945).
4. Moores, R. G., and Campbell, H. A., *Anal. Chem.*, **20**, 40-7 (1948).

Microfilm copy of complete manuscript of 106 pages, \$1.33. Enlargements 6" x 8", 10¢ per page. Library of Congress card number MicA54-354.

STUDY OF MOLYBDENUM, TECHNETIUM  
AND NEODYMIUM RADIOISOTOPES

(Publication No. 6824)

Robert A. Naumann, Ph.D.  
Princeton University, 1953

With the advent in 1948 of the nuclear shell theory, which permits predictions of nuclear properties, the study of the decay schemes of radioactive isotopes became important. A study of the radiations of three radioactive isotopes, molybdenum 93, technetium 92 and neodymium 141, has been undertaken since these isotopes contain 51, 49 and 81 neutrons respectively and lie close to the closed shells containing 50 and 82 neutrons. These closed shells are analogous to the electronic configurations found in the rare gases and nuclei possessing the neutron numbers 50 or 82 should have increased stability. In the decay studies of cyclotron-produced isotopes, separation of radioactive elements by chemical means is important for both purification and identification. Since these isotopes are produced in cyclotron targets at concentrations below  $10^{-4}\%$ , it is usually necessary to separate them from the inert target material.

The positrons and gamma rays accompanying the decay of neodymium 141 to stable praseodymium 141,

which contains 82 neutrons, have been described by other investigators. In order to measure the energies of these radiations and to determine the decay scheme, neodymium 141 was prepared in the Princeton University cyclotron. A lens beta ray spectrometer was reassembled and calibrated. This instrument was used to examine the emitted positrons. The energy of these positrons was determined as  $0.780 \pm 0.008$  Mev and, in addition, unreported conversion electrons corresponding to a gamma ray of energy  $1.14 \pm 0.01$  Mev were observed. A successful search for a gamma ray of this energy was made with a gamma ray scintillation spectrometer, which also gave evidence of a much weaker 1.28 Mev gamma ray associated with the decay of neodymium 141. Coincidence studies demonstrated that the gamma radiation does not follow positron emission. A decay scheme is proposed for neodymium 141 in which the positron emission occurs between the ground states of neodymium and praseodymium 141. The energy difference between the atomic masses of these two isotopes is then  $1.80 \pm 0.008$  Mev. The semi empirical mass equation predicts a value of 0.531 Mev for this quantity. The difference could be attributed to a stable closed neutron shell of praseodymium 141.

A radioactive isotope decaying with a 6.7 hour half life has been ascribed to molybdenum 93. The mass assignment requires that this nucleus have 51 neutrons as well as the 42 protons of molybdenum. The decay of this nucleus has been previously reported to consist only of three gamma ray transitions in cascade, indicating that the 6.7 hour activity belongs to an excited state of molybdenum 93 decaying to a ground state of molybdenum 93 which itself would be unstable since this molybdenum isotope does not occur naturally. The mass assignment of 93 to this activity has been questioned both because of failure to produce the activity by slow neutron bombardment of stable molybdenum 92 and because of the apparent incompatibility of the cascaded gamma rays with the expected decay scheme. The decay and mass assignment of this activity was therefore reexamined. The activity was prepared by proton bombardment of stable niobium 93 in the Princeton cyclotron. Using a beta ray spectrometer, the conversion electrons from all three gamma rays were examined and the gamma ray energies were precisely determined. Conversion electrons from the third gamma ray, which had hitherto escaped observation, were detected. No change in nuclear charge occurs during the decay of this activity so the decay must be that of an excited state to a ground state.

A search for a long-lived molybdenum daughter was undertaken. Intense sources of the 6.7 hour molybdenum activity which had been chemically separated showed no activity above background after decaying for a period of one month. The half life of any daughter ground state activity is hence estimated as greater than 1.8 years. An attempt was made to prepare molybdenum 93 by a p,pn reaction on stable molybdenum. Natural molybdenum was bombarded with protons and a molybdenum fraction was chemically isolated free from the technetium activities

simultaneously produced. The molybdenum fraction showed no 6.7 hour activity, although both molybdenum 91 and molybdenum 99 activities produced by p,pn reactions on stable molybdenum 92 and 100 were observed. In order to verify the mass assignment of the 6.7 hour molybdenum the excitation function for the production of this activity by proton bombardment of niobium was made. The shape and threshold of this excitation function indicate that a p,n reaction produces the activity and confirms the mass assignment of 93 to the 6.7 hour activity,  $\text{Nb}^{93}(\text{p},\text{n})\text{Mo}^{93}$ .

An excitation function study of the 4.5 minute technetium confirms a mass assignment 92 to this activity. Two hitherto unreported gamma rays of energy 0.76 and 1.47 Mev were found to be associated with this activity.

Microfilm copy of complete manuscript of 115 pages, \$1.44. Enlargements 6" x 8", 10¢ per page. Library of Congress card number MicA54-355.

#### THE REACTION BETWEEN OXYGEN AND HYDRAZINE VAPOR

(Publication No. 6842)

Charles Isaac Tewksbury, Ph.D.  
Princeton University, 1953

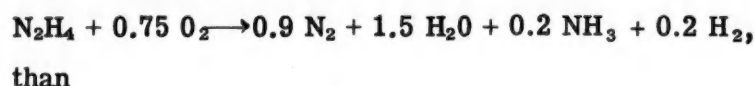
The rate of the reaction between oxygen and hydrazine vapor in Pyrex glass systems has been measured for a number of different conditions of pressure and temperature. One series of experiments was performed using a flow method; another was carried out under constant volume conditions.

The flow experiments were done in the temperature range 180-225° C, and nitrogen was used as a carrier gas and diluent. It was found that in this system hydrazine ignited spontaneously in the presence of oxygen at about 270° C. Explosions were encountered at temperatures as low as 235° C, but not below. The results of these experiments indicate that the reaction is complex. On the basis of initial rates the reaction appears to be first order with respect to oxygen and one-half order with respect to hydrazine at 180° and 200°, and first order with respect to each at 225° C. An increase in the surface to volume ratio of the reaction vessel caused an increase in the rate of reaction, but the increase in rate was far less than the increase in the surface to volume ratio. The increase in rate was accompanied by a similar increase in the ratio of ammonia formed to hydrazine reacted. This suggests that the disappearance of hydrazine is due in part to a heterogeneous reaction of which ammonia is a product. The effects of different methods of cleaning the glass, coating the reactor with potassium chloride and substituting helium as the carrier gas in place of nitrogen were negligible. Activation energies of 11 and 9.5 kcal/mole were calculated for the reaction in the empty and the packed vessels, respectively.

The constant volume experiments were carried out at temperatures of 95-140° C. In these runs the



course of the reaction was followed by the rise in pressure accompanying the reaction, supplemented by chemical analyses. The stoichiometry has been shown to be more nearly



as was previously reported. These experiments confirm the complex nature of the kinetics of the reaction. Simple rate expressions do not account for the observed facts, since the rate appears to depend on the ratio of the reactants as well as the concentration of each. Water and ammonia were found to inhibit the reaction. The effect of ammonia is not important since only small amounts are formed, but the inhibition by water must be considered because it is a major reaction product. An empirical equation of the form

$$\text{rate} = - \frac{d(\text{N}_2\text{H}_4)}{dt} = k_{\text{exp}} \frac{(\text{O}_2)}{1 + \frac{(\text{O}_2) + n(\text{H}_2\text{O})}{m(\text{N}_2\text{H}_4)}}$$

was developed which adequately fits the experimental observations. The values of  $m$  were 1.5, 3, and 6 and the values of  $n$  were 5, 2.5 and 1, at 94°, 120° and 138° C, respectively. An activation energy of 11.5 kcal/mole was calculated from the values of  $k_{\text{exp}}$  at 94°, 120° and 138° C. Some runs were made to determine the effects of surface on the reaction. A large change in the surface to volume ratio produced only minor changes in the reaction rate, but the kinetics of the reaction also appear to have been changed. Coating the vessels with potassium chloride did not appreciably affect the rate.

The results of this work are in disagreement with those reported by other investigators. These discrepancies have been discussed and it is suggested that surface effects are responsible.

Microfilm copy of complete manuscript of 83 pages, \$1.04. Enlargements 6" x 8", 10¢ per page. Library of Congress card number MicA54-356.

## NUCLEATION OF SUPERSATURATED POTASSIUM NITRATE SOLUTIONS

(Publication No. 7070)

Malcolm Lunt White, Ph.D.  
Northwestern University, 1953

If a large number of samples of supersaturated solution are observed over a period of time, the rate of crystallization or nucleation of these samples should follow first order kinetics if the current theory of homogeneous nucleation is accepted. It has been found that a large number of samples can be studied by forming small droplets of potassium nitrate solution in mineral oil, supersaturating them and letting them fall through a column of oil. By forming the droplets continually a line of them can be made to fall through the oil and by determining the percentage of the droplets crystallized at various positions in their line of fall which corresponds to a time of supersaturation, the first order rate equation can be checked.

With unpurified solutions the data indicate that the nucleation is being catalyzed by the impurities present which cause an initially high rate. In order to study homogeneous nucleation, a purification of the solutions, including both recrystallization and filtration, was used. With solutions treated in this way it is shown that homogeneous nucleation predominates, so that rates for this process can be determined.

The relation of the rate of nucleation to the amount of supercooling, as measured by the lowering of the temperature below the saturation temperature, was found to agree with a relation which can be derived from the classical theory of nucleation. According to the theory the rate should be dependent on the volume of the sample studied and this has been confirmed, although the results are not conclusive.

Microfilm copy of complete manuscript of 77 pages, \$1.00. Enlargements 6" x 8", 10¢ per page. Library of Congress card number MicA54-357.

## ECONOMICS

### ECONOMICS, GENERAL

#### THE ROLE OF THE COMMUNITY IN ECONOMIC DEVELOPMENT

(Publication No. 6915)

Frederick Chester Armstrong, Ph.D.  
University of Illinois, 1953

There is a growing interest in the community as an agent for economic development. This interest manifests itself in the community development movement which is a conscious attempt to influence the allocation of resources and geographic distribution of income. The allocation of resources and the

geographic distribution of income are truly economic problems but problems which, at the community level, have not attracted the attention of the economist. His preoccupation in this regard has been with the theory of localization of industry which assumes, tacitly, that the community has a passive role in economic development. The community development movement belies this, however, and the purpose of this study is to show in a general form the role the community plays in economic development. Specifically, it is a study of the role of the community, as such, in reducing the disparity of income among communities.

To that end, three economic concepts of the community are reviewed as to origin, nature and usefulness. These three concepts of the community are:

the theoretical distribution of communities, the industrial pyramid and the community as a source and use of funds center. With these three concepts and what scant statistical data there are on income disparity among communities one can draw the following conclusions: (1) A wide disparity of income among communities does exist. (2) Per capita income tends to vary directly with the size of the community. (3) The ladder of income distribution by economic centers is — from low to high — raw material producing centers (including agriculture), manufacturing centers, and commercial and financial centers (including government). (4) Regional differences are an important influence on per capita income but not so important as are the size and function.

These characteristics of the geographic distribution of income among communities tell little of the community function in income creation. The contribution of the community to income creation, apart from the direct contribution, is in the form of social capital. Social capital falls into three classes: external economies attributable to human resources, gifts of nature, and basic material assets of the community. The study indicates the role of social capital in income creation both from the points of costs of production and of function. The true importance of social capital is found in its function but equally important to this is the fact that social capital can be created. A proper program of community development requires, therefore, the controlled creation of social capital.

The nature of the community development is investigated and its techniques are analyzed as to their ability to create social capital. This ability, it is found, is restricted due to jurisdictional and financial limitations, the fact that economic decisions of importance to the community are made in sectors of the economy other than the community and that regional considerations are often more important in economic development than are community considerations.

The following conclusions are drawn concerning an effective community development movement: (1) There is a need to reorient our thought concerning communities. They must not be considered as passive, but rather as holding collectively a quantity of social capital which is not to be dissipated or abused but rather to be utilized, replaced and augmented. (2) The implementation of social capital creation requires, in its controlled form, public investment. (3) The social capital created must conform to technological reality. (4) Unfair competition among communities to attract industry must be eliminated. (5) Since the community is the site of economic progress, continued economic progress may require federal aid for those communities financially and jurisdictionally unable to create the necessary social capital for economic progress.

Microfilm copy of complete manuscript of 186 pages, \$2.33. Enlargements 6" x 8", 10¢ per page. Library of Congress card number MicA54-358.

# AN INVESTIGATION OF METHODS FOR MEASURING GEOGRAPHICAL DIFFERENCES IN THE COST OF LIVING

(Publication No. 6950)

Elmore Alan Hale, Ph.D.  
University of Illinois, 1953

The purpose of this study was to develop and test a new method of measuring geographical differences in the cost of living.

The thesis has four major divisions. The first is a short history high-lighting the economic theories useful in attacking this problem, the statistical developments that preceded the present formulation of the problem, and the growth of various techniques in consumption analysis. The second is the analysis of the Konus condition for approximating the "true" index of the cost of living under the assumption that the consumers indifference map is known. The third is a description and analysis of the current approaches to the problem of measuring geographical differences in the cost of living, and the development of a new approach. The fourth section is devoted to a statistical testing of the methods.

It is well known that the Konus condition is unsatisfactory for the determination of the limits of the "true" cost of living index, since it requires that the consumers indifference map be known. As Staehle has pointed out, if the indifference map is known, then there is no need for an approximation. The index can be known exactly.

Three methods have been developed in the literature to overcome this defect. These are the "Double Expenditure" method and the "Flexibility" method of Frisch and the "Valley of Equivalence" method of Staehle. In addition to these three methods, a new method, the Spending Elasticity method was developed. This method is based on the fact that consumers tend to satisfy their needs for necessities first. As income increases, the amount of luxuries consumed increases. The definition of equivalence of satisfaction used here is that when two average consumers (or families) spend the same percentage of their total income (or total expenditure) on necessities, they have equal satisfaction. A cost of living index can be calculated by taking the ratio of the money incomes that provide equivalent satisfaction.

This definition, as well as the "Double Expenditure" method and the "Valley of Equivalence" method was tested, using consumer expenditure data from the U. S. Bureau of Labor Statistics survey, "Family Income, Expenditures and Savings in 1945; Birmingham, Ala., Indianapolis, Ind., Portland, Ore.," Bulletin 956. The "Flexibility" method was rejected because of the lack of data for its application. The "Double Expenditure" method and the "Valley of Equivalence" method required price data as well as expenditure information to be available. Price information was available for food items only. Consequently, only cost of living indexes for food were calculated.

The results of this statistical testing indicated that the method developed by the author gave results consistent with Laspeyres price indexes. The "Double



Expenditure" method also gave satisfactory results, but, based as it is on the assumption of the same indifference maps in all cities, it is of limited usefulness when cities or areas of widely differing climate or economic conditions are being compared. The "Valley of Equivalence" method of Staehle did not give satisfactory results.

The Spending Elasticity method does not require that the same goods and services be consumed in the cities or areas under comparison. It does not require the assumption of the same indifference map in all cities. The generality of the theoretical base, combined with the satisfactory statistical results, indicates that this method may be a possible solution to the problem of measuring geographical differences in the cost of living.

Microfilm copy of complete manuscript of 174 pages, \$2.18. Enlargements 6" x 8", 10¢ per page. Library of Congress card number MicA54-359.

AN ECONOMIC ANALYSIS OF IRRIGATION  
DEVELOPMENT WITH PARTICULAR REFERENCE  
TO MULTIPLE-PURPOSE DEVELOPMENT  
OF THE TRUCKEE-CARSON RIVER SYSTEM  
IN WESTERN NEVADA

(Publication No. 6980)

Frank Sanford Scott, Jr., Ph.D.  
University of Illinois, 1953

This study is concerned with the design, analysis, and application of criteria for attaining maximum utilization of the land and water resources of the Truckee and Carson river basins of western Nevada, with primary reference to irrigation.

The agricultural potential of the project area is attainable through the combination of two sources: (1) a nearer approach to optimum utilization of the lands now under irrigation and (2) further multiple-purpose development of the Truckee and Carson rivers.

The study indicates that not only the existing, but also the potential intensity of development of the problem area as compared with the average of all Federal Reclamation projects is low. Most of the 145,000 acres of land now under irrigation in the project area is devoted to the production of alfalfa hay, cereals and irrigated pasture. Lack of intensity of agricultural development thus far achieved in the project area is attributable largely to four factors: (1) the small percentage of the total land area adaptable to intensive crops, (2) an inadequate volume of production of intensive crops to encourage establishment of necessary processing plants in the case of some crops and effective marketing channels in the case of others, (3) inadequate promotion of intensive crops by local agricultural agencies, and (4) location with respect to outside grazing.

Other factors tending to limit intensity of crop production in the project area are: opportunities for feeding cattle in transit, off-project demand for

alfalfa hay, climatic limitations, plant diseases and insect pests, characteristics of the farm population, water shortages, and drainage deficiencies.

Except for better promotion, control of diseases and insect pests, and provision for supplemental water and drainage, the limiting influence of the above factors is, for the most part, expected to be continuous. Most of the small anticipated increase in intensity would come through greater yields of alfalfa, small grains, and pasture, and only to a limited extent through greater acreages in highly intensive crops.

To the extent that irrigated lands are associated with desert and mountain grazing operations, the highest priority of use is for feed production for cattle and sheep ranches producing stockers and feeders. For the irrigated lands not associated with outside grazing, dairying is the best adapted type of livestock production. The market potential favors an increase in fluid milk production at the expense of sour cream production.

The greatest opportunity for expanding agricultural production in the problem area is through Federal multiple-purpose development of the Truckee and Carson rivers. The need for additional hydroelectric power constitutes the strongest argument for further development of the river system. Without power development, further irrigation development would be quite limited. Also standing to benefit from further upstream development are flood control, municipal and industrial establishments, recreation, and fish and wildlife conservation.

Analyses of criteria for project formulation indicate, among other things, that in light of present knowledge: (1) only primary and not secondary benefits should be used in project formulation, (2) the policy of paying part of the construction costs allocated to irrigation from the interest component on construction costs allocated to power should be discontinued.

It is also recommended that the limited number of potential new farms be 2 man-units in size.

Through proposed project development, the total increase in agricultural production as a result of provisions for supplemental water, drainage, and reclamation of new lands would be equal to an estimated productivity equivalent of 39,774 acres of the average of lands now under irrigation. This approximates 27 percent of the total acreage now under irrigation in the project area.

Microfilm copy of complete manuscript of 335 pages, \$4.19. Enlargements 6" x 8", 10¢ per page. Library of Congress card number MicA54-360.

## ECONOMICS, COMMERCE — BUSINESS

## AN ANALYSIS OF SALES FORECASTING POLICIES, PROCEDURES, AND TECHNIQUES

(Publication No. 6930)

Charles Merle Crawford, Ph.D.  
University of Illinois, 1953

The overall purpose of this study was to make a thorough analysis of sales forecasting policies, procedures, and techniques. There were four avenues of approach: (1) a conception of sales forecasting as a broad program of action rather than as a series of disconnected techniques; (2) a tracing of the early historical development of sales forecasting; (3) appraisal of the various forecasting techniques to determine the criteria by which they are considered for use; (4) a specification of the problems which are today restraining needed advances in forecasting accuracy.

To fulfill these purposes several things were necessary. First was a complete investigation of pertinent historical and contemporary writings, especially those containing remarks by sales forecasters on their problems and attempted solutions. Coincident with this, a series of lengthy interviews with sales forecasters and other executives in twenty small, medium, and large firms in the middlewest was carried on.

Results of the investigation fall into two areas — historical and development and present-day practice. The historical development was primarily a phenomenon of the early 1900's; little evidence was found of a conscious need for sales forecasting prior to 1900, and by the late 1920's sufficient knowledge was available for most companies to establish programs leading to reasonably accurate sales forecasts.

The results pertaining to present practice can be grouped into three areas — (1) why businessmen forecast sales, (2) the type of program they set up to get the forecasts they want, and (3) the specific techniques they use. Businessmen report that the most important reason for forecasting sales is to achieve internal guidance and control (production scheduling, budgeting, sales control, et cetera). There are also allied managerial benefits of lesser importance.

The type of program needed to get the forecasts desired is a more difficult problem. Useful sales forecasting seems to require that full consideration be given to corollary aspects of the task, some prior to and some subsequent to actual preparation of an estimate; consequently, a complete program entails planning, organizing, performance, and control. Planning includes a careful statement of the particular sales figures that should be forecast as well as the adoption of general company policies conducive to the activity. Organizing for sales forecasting follows the principles of general management with particular emphasis on the questions of departmentalization and individual responsibility. Performance includes the actual preparation of the forecasts, and control entails actions to help insure usefulness in present and future forecasts.

It is difficult to specify the techniques used. All

sales forecasts rest heavily upon personal judgment, but supplementary analysis can improve the quality of that judgment. In general, forecasters have found a great variety in the techniques that can be used to supplement judgment, but any classification falsely implies that they can be used void of judgment. Forecasts that can be formulated safely, on the basis of statistical techniques or peculiar data sources alone, are probably non-existent, but there is a wide range in the degree to which the necessity of reliance on judgment alone is present. Specifically, forecasters use surveys of buyers and others, statistical techniques based on correlation, and data developed from the so-called input-output approach, all as supplementary devices. This study encompassed lengthy appraisal of these tools, with emphasis on viewing them within the environment of the individual firm and as a group of alternatives from which a choice or one or several can be made.

A final step in the investigation was an intensive analysis of sales forecasting in a medium-sized, midwestern firm, including study of both present policies, procedures, and techniques, and alternative ones.

Overall, this study has disclosed the considerable extent to which sales forecasting has been adopted as a business practice, but the problems involved in the activity have by no means all been solved.

Microfilm copy of complete manuscript of 338 pages, \$4.23. Enlargements 6" x 8", 10¢ per page. Library of Congress card number MicA54-361.

## STANDARD COSTS AND PRICE FLUCTUATIONS

(Publication No. 6971)

Gerald Kenneth Nelson, Ph.D.  
University of Illinois, 1953

Standard costs have long been one of the most valuable tools of management. They have for many years performed outstanding service as a time and money saving bookkeeping device, as a method of cost control, and as an aid to formulation of plans and policies. Management could get even more assistance from standard costs, however, if it would employ some method of showing clearly the effects of price changes in the various accounting reports on operations prepared for management and other interested groups. The fluctuation of the price level creates many accounting problems. Profit figures are misleading and costs of operation and production give improper guides to management policy since they are based on costs incurred in many time periods. Budget preparation is hampered and statement comparisons lose their significance because the changes cannot be properly analysed.

In determining the type of information which management needs on price fluctuations, it must first be remembered that the primary objective of any business is the realization of a satisfactory profit. Reports to management should therefore be designed



with this basic objective in mind. There are two types of profits, however; that which is actually the result of good management, and that which is caused by changes in prices. Management profits represent that increase in net worth which would occur if there were no changes in prices, whereas market profits occur from price influences entirely outside the control of management.

The attainment of the desired profit involves the planning and control of each of the three functions of a business: namely, those of production, marketing and finance. Thus there are really six types of information needed. Little can be done in the way of controlling market profits and losses, although losses can be minimized and profits increased by careful purchasing and inventory control measures. For the most part the problem as far as reports for control purposes are concerned is one of elimination of the non-controllable part so that the reports show only expenses which are controllable. For information purposes, a complete analysis of market profits and losses as well as other profits and losses is necessary. Decisions which must be made with the aid of such reports include pricing, whether to make or buy, whether to expand operations, whether to replace equipment and many others.

It is not necessary to adjust the balance sheet to current cost figures because the present form of the balance sheet based on original costs is best for those few uses attributed to the balance sheet. The final figure on the income statement must, therefore, also be based on original cost if the statements are to tie in together as they should. Current costs should be used only to analyse the profit figure obtained by traditional accounting methods to explain completely its causes. Operating results based on actual dollars are needed for many purposes.

Methods have been designed in the dissertation whereby the data required for preparing statements based on current cost can be obtained in conjunction with a normal standard cost system without an appreciable amount of extra clerical effort. In the system described replacement costs are used whenever they differ materially from original costs. They are a better measure of the sacrifices made by management in obtaining revenue than are adjustments based on purchasing power indexes.

In addition to their usefulness to management, reports analysing the effects of price changes are also of great value to most other users of financial statements.

Microfilm copy of complete manuscript of 174 pages, \$2.18. Enlargements 6" x 8", 10¢ per page. Library of Congress card number MicA54-362.

**WOMEN IN WHITE COLLAR JOBS:  
THE STUDY OF AN ECONOMIC  
AND SOCIAL MOVEMENT (1910-1950)**

(Publication No. 7108)

Helen Johnston Recknagel, Ph.D.  
New York University, 1953

The purpose of this study was to appraise the influence of economic and social trends upon the movement of women into white collar (clerical and sales) jobs in the United States between 1910 and 1950. In order to appraise these influences, the investigator sought factual information by compiling data from 1910 to 1950 on (1) labor force trends; (2) economic trends related to employment; and (3) the explanations offered by labor force analysts.

An examination of labor force trends found that the number of persons engaged in white collar work in the United States had doubled between 1910 and 1950 while the number of women engaged in such work had increased 460 percent. In 1910, about 28 percent of all white collar workers were women; in 1950, 52 percent of them were women.

Next, the labor force trends were compared with the generally accepted economic indexes for the Gross National Product, Industrial Production, Wholesale Prices, Personal Income, Consumers' Expenditures, Taxes, Savings, and the real earnings for clerical and sales workers. To eliminate price fluctuations, these economic indexes were based on the 1939 constant dollar.

As a result of these statistical analyses, it was evident that women's movement into white collar jobs was linked to changes in (1) the nation's industrial output, (2) Consumers' Expenditures (living standards), and (3) the purchasing power of white collar earnings. The impact of such changes upon the movement of women into white collar jobs was accentuated by war-time and depression conditions. The index for Industrial Production was found to be a good barometer for changes in the employment of women workers and of women white collar workers in particular. The index for Consumers' Expenditures also paralleled these two indexes for women workers. On the other hand, the index for women white collar workers moved in reverse of the trend for white collar purchasing power. The movement of women into white collar jobs was accelerated during World Wars I and II when jobs were plentiful and white collar earnings were low. This movement was retarded during the depression when jobs were scarce and white collar earnings were high.

The relation of recent social trends in the United States to the movement of women into white collar jobs was traced by examining the factual evidence available for these factors of social change: (1) demography, (2) technology, (3) politics, (4) labor organizations, (5) education, and (6) the mores. Upon analysis, the movement of women into white collar jobs was found to be related to four major developments within the United States between 1910 and 1950:

1. The trend for the population to shift from rural communities centered around agriculture to urban communities centered around industry.

2. The trend for women to follow their traditional tasks out of the household to work for pay.

3. The trend for clerical and sales jobs to expand in relation to other occupations.

4. The trend for clerical and sales jobs to attract fewer men proportionately than formerly because of the low real earnings and because of the limited opportunities for promotion in such jobs.

In forecasting the future trend for women workers in white collar jobs, the economic outlook is all important. The extent of mechanization and of unionization in white collar work also enters into the picture, but, as this investigation has found, either development is hinged upon economic conditions.

In summary, whenever appropriate opportunities are open to them, women work in white collar jobs mainly to raise their own and their families' standard of living.

Microfilm copy of complete manuscript of 254 pages, \$3.18. Enlargements 6" x 8", 10¢ per page. Library of Congress card number MicA54-363.

#### THE PROVISION OF DISABILITY AND MEDICAL CARE INSURANCE THROUGH COLLECTIVE BARGAINING: AN ANALYSIS OF TEN PROGRAMS

(Publication No. 6839)

Fred Slavick, Ph.D.  
Princeton University, 1953

The failure of large segments of the American community to receive adequate medical care and to enjoy some measure of income maintenance during periods of disability has led to increased interest in the insurance mechanism as a means of eliminating the threat to economic security and well-being posed by illness and accident. Although there is widespread agreement as to the applicability of the insurance device, there is much disagreement as to whether this mechanism should be applied on a voluntary basis or under a compulsory government program.

Among those experimenting with the voluntary approach in recent years have been trade unions and employers. These groups have established and are operating medical care and disability insurance plans as part of the regular collective bargaining process. The extent to which unions and employers can meet the medical care and income maintenance needs of employees through collective bargaining depends on their ability to administer such programs effectively and on the degree to which they can utilize their insurance plans to increase the demands for and supply of medical services.

This study of the experience of ten union-management programs which have been in operation for periods ranging from five to twelve years indicates that sound workable programs to provide some

degree of protection to employees can be operated successfully through collective bargaining. Administrative problems found were surprisingly few. These included, to varying degrees, carelessness on the part of employers in remitting insurance contributions and maintaining records, malingering by employees in a few cases, and maintaining employee understanding of benefit provisions and claim procedures. Experience showed, however, that a substantial approach to a solution of these problems can be made without requiring fundamental changes in administration and without affecting adversely union-management relations.

The shortcomings of the plans lie in the degree of protection which they provide against the hazards of actual disability and in their lack of provision for preventive medicine. By and large, those responsible for policy under the plans studied have not exploited the potentialities inherent in their plans to meet the medical care problems of the employees covered. This has been due primarily to leadership inertia and lack of employee education in medical and insurance matters. In addition there are areas where attempts to provide comprehensive insurance conflict with other goals of these groups. However, several of the programs studied which operate in localities where comprehensive insurance is available for purchase do provide coverage which comes close to meeting the total medical needs of employees. This indicates that on the demand side the factors inhibiting the necessary allocation of resources can be overcome if a sufficiently great effort is made by the group leadership.

The most serious problem faced by unions and employers as well as by other groups attempting to finance medical care on a prepaid voluntary basis concerns the supply of medical personnel and facilities and the supply of comprehensive prepayment plans. The former can be increased only slowly. The relative scarcity of the latter is due in large measure to the opposition of organized medicine to plans which combine group practice and a capitation system of reimbursement for participating physicians. If maximum utilization is to be made of the voluntary approach greater effort and cooperation by and between the medical profession, lay organizations, and the various levels of government are required in order to increase the amount and improve the organization of such personnel and facilities.

Microfilm copy of complete manuscript of 316 pages, \$3.95. Enlargements 6" x 8", 10¢ per page. Library of Congress card number MicA54-364.

#### PERSONNEL POLICIES AND PRACTICES IN OFFICES WITH 5 TO 100 EMPLOYEES

(Publication No. 7066)

Eldred C. Speck, Ph.D.  
Northwestern University, 1953

The primary purpose of this study was to determine current personnel policies and practices in



offices having 5 to 100 employees. For statistical purposes, personnel policies and practices were classified into the following five areas: (1) Employment procedures; (2) Employee induction and training; (3) Compensation and benefits; (4) Miscellaneous personnel activities; (5) Managerial control. A secondary objective was to determine the relationship between size of offices and the present status of personnel management.

The data for the study were obtained through the use of questionnaires and by interview. A four-page printed questionnaire was distributed to personnel directors, office managers, and other company officials in charge of personnel activities. A total of 359 offices returned questionnaires properly completed. These 359 firms represent 18 different types of businesses, employing 16,848 office workers. To supplement the data obtained through questionnaires, 20 offices were visited and interviews held with the person in charge of personnel.

In order to determine whether or not a relationship exists between the size of offices and the personnel policies and practices in effect, the 359 returns were divided into three groups according to the number of office workers employed. Group I includes those firms with 5-25 office employees; Group II, those businesses with 26-50 office workers; and Group III, those concerns having 51-100 clerical employees. Of the 359 participating companies, 131 are in Group I, 95 in Group II, and 133 in Group III.

Significant findings of the study include the following:

**Employment Procedures.** The average office uses five different sources of recruitment. Job descriptions and specifications are used by 63 percent of the offices in hiring employees; tests by 42 percent. Physical examinations are required by one-fourth of the organizations. Two-thirds of the offices hire part-time workers.

**Employee Induction and Training.** A definite indoctrination procedure is in effect in 39 percent of the offices. Twenty-three percent of the companies have formal training programs for rank and file office workers; 24 percent have formal supervisory and executive training programs.

**Compensation and Benefits.** Job evaluation is carried out by 35 percent of the companies. Wage incentive plans are in effect in only 9 percent of the offices. Almost one-half of the participating firms pay bonuses to office employees. Only 2 percent of all offices work more than 40 hours a week; whereas, 43 percent work less than 40. The 5-day week is in effect in 89 percent of the offices. Twenty-one percent of the offices have profit-sharing plans; 8 percent have stock-purchase plans. Formal pension plans are in effect in 52 percent of the businesses.

**Miscellaneous Personnel Activities.** One-third of the offices have suggestion systems. Music is provided in 20 percent of the offices. Seventy-six percent of the offices have official rest periods, and 9 out of 10 of these grant 2 rest periods per day, usually 15 minutes each. Morale surveys are conducted in 14 percent of the offices. Only 3 of the 359 offices are unionized.

**Managerial Control.** One-third of the offices have comprehensive written statements of their basic personnel policies. Formal merit rating programs are found in only 22 percent of the participating concerns. Job analysis is carried out in 38 percent of the offices; job descriptions are prepared by 48 percent.

**Relationship Between Size of Offices and Personnel Practices.** In general, the survey indicates that there is a considerable difference between the personnel policies and practices in effect in offices of different sizes. With only a few exceptions, the larger the office the greater the tendency for management to establish and maintain the personnel practices considered in this study.

Microfilm copy of complete manuscript of 206 pages, \$2.58. Enlargements 6" x 8", 10¢ per page. Library of Congress card number MicA54-365.

## INFLUENCE OF TRADITIONS IN ACCOUNTING

(Publication No. 7000)

Arthur Ramer Wyatt, Ph.D.  
University of Illinois, 1953

In spite of obvious progress in bookkeeping methodology and refinements in accounting concepts over the years, accountants of the mid-twentieth century are beset with numerous criticisms and unsolved problems of considerable magnitude. Many present-day critics feel accounting development has been retarded by continued adherence to old ideas and concepts. Accounting is considered by some to be steeped in traditions, while accountants are many times classified as traditionalists.

This study investigates the nature of tradition, with primary consideration placed upon a study of traditions in accounting. The purpose of the study is not to affirm or deny the existence of accounting traditions, but rather to determine the type of influence which inheritances from the past have exerted on the development of accounting. cursory examination of accounting literature indicates that traditions are generally considered to be detrimental to accounting growth. The suitability of this conclusion appears questionable when one recognizes the obvious growth in service and usefulness of accounting in the last fifty years, and the obvious reliance in accounting on practices and concepts from the past.

Traditions are actions or attitudes which may be justified largely by their prior usage in similar circumstances; actions or attitudes justified now by reference to past usage without necessarily looking at the conditions precedent to the prior usage; attitudes which tend to perpetuate widely used and generally accepted actions. Reliance on traditions in any area of knowledge affords that area with a degree of stability which might otherwise be absent.

This study of traditions in accounting deals primarily with financial accounting theory and practice. The various practices and problem areas considered are classified according to certain accounting

functions. In the recording area such problems as the use of the monetary unit of measure, reliance on cost as the basis of accountability, and the treatment of cash and bond discounts are considered.

A study of the matching area deals with the influence of tradition in such problem areas as depreciation accounting, the use of lower of cost or market and of last-in, first-out inventory procedures, the use of estimates in accounting, and the approach generally made to the determination of income.

In the reporting area the general form and content of financial statements are studied to determine the nature of the influence of tradition. Other reporting practices studied are the reporting of treasury stock, the use of "reserves," the reporting of prepaid expenses, and the use of "surplus."

The area of professional accounting considered certain traditions which have contributed to the present position of the accounting profession. Certain traditions in auditing practice are also discussed, with a view to determining the influence of tradition on the growth of professional accounting.

The study of traditional actions and attitudes in accounting disclosed that tradition as such is neither good nor bad. Each tradition must be studied in the light of existing conditions before sound conclusions as to its suitability are possible. There is little doubt, however, that the existence of a traditional influence tends to keep accountants from having a constant vacillating methodology, tends to foster a certain degree of stability in the accounting framework.

At times the influence of tradition tends to promote extreme stability in the accounting methodology. At this point the influence of tradition may not be beneficial to accounting growth. While it is necessary for a service profession, such as accounting, to evidence a certain degree of stability to achieve the reliance necessary for continued usefulness, extremes of stability probably do not foster continued usefulness. Just as accounting must not reach the extremes of flexibility, neither must it approach the extremes of inflexibility.

Microfilm copy of complete manuscript of 261 pages, \$3.26. Enlargements 6" x 8", 10¢ per page. Library of Congress card number MicA54-366.

## ECONOMICS, FINANCE

### AN ANALYSIS OF THE EXAMINATION AND OTHER REQUIREMENTS FOR THE CERTIFIED PUBLIC ACCOUNTANT CERTIFICATE

(Publication No. 6920)

Heimie Edward Breen, Ph.D.  
University of Illinois, 1953

The professional public accountant's role in society has been well established during the past thirty-five years. The general professional standards

advocated by the American Institute of Accountants set forth the professional qualities necessary for the maintenance of the high professional status of the public accounting profession. This thesis is concerned with the devices set forth in state laws and regulations for the testing of the professional qualities necessary in the practice of public accountancy for the protection of the public interest.

An historical review of the examinations for the certified public accountant certificate from 1896 to 1952 revealed that the State Boards of Accountancy and the Board of Examiners of the American Institute of Accountants had been confronted with problems relating to length of the examination, subject matter, and the level at which the examination should be directed.

A study of examination requirements revealed that use of a uniform examination for the CPA certificate implies uniformity although all other phases of control of the profession of accountancy vary considerably among the states.

The pre-examination requirements of citizenship, age, evidence of good moral character, legal residence, education, and experience should be the same in all states. A lack of uniformity exists with respect to some of these pre-examination requirements which has definitely affected the success of the candidates in CPA examinations.

Evidence is available which indicates that a single uniform CPA examination is not an adequate test of all the professional qualities required in a professional public accountant.

The problem of determining whether the uniform CPA examination tests the professional qualities of the certified public accountant was resolved in this manner:

1. The professional qualities necessary in the practice of public accountancy were set forth, divided into technical and personal qualities.
2. An analysis and classification of the CPA examination questions in accounting was prepared for the period May, 1948 through November, 1952.
3. A comparison of examination questions with professional qualities was made to appraise the adequacy and validity of the examination.

This comparison indicated:

- A. The sum total of professional qualities cannot be tested in a single uniform examination.
- B. The technical qualities set forth as essential in the practice of public accountancy are tested on a sample basis.
- C. That portion of the professional qualities described as personal qualities is tested to some extent, but not to the extent necessary to test adequately the candidate for the CPA certificate.

D. The testing of two of the most essential attributes of successful practitioners of accountancy, judgment and professional consciousness, is rather ineffectual in the present uniform CPA examination.

Recommendations based upon this study include the following:

1. Strengthening of the pre-examination requirement of education through higher minimum education requirements.



2. Strengthening of the pre-examination requirement of experience through strict registration programs administered by the state CPA societies.

3. Strengthening of the pre-examination requirement of good moral character through an oral interview and obtaining additional information.

4. The addition of personality, aptitude, and other tests of a like nature to test special professional qualities.

5. The addition of another examination session on "Practical Auditing" in order to strengthen the test in this area.

6. The adoption of the "double examination" idea, a preliminary and a final examination with pre-requisites of education and experience applying to each examination respectively.

7. Development of subject and case material in accordance with the changes in function of the public accountant in recent years.

Microfilm copy of complete manuscript of 261 pages, \$3.26. Enlargements 6" x 8", 10¢ per page. Library of Congress card number MicA54-367.

#### THE ROLE OF MONEY IN AGGREGATE DEMAND, 1865 TO 1900

(Publication No. 6932)

Alan Davis Dailey, Ph.D.  
University of Illinois, 1953

The principal purpose of this study is to re-examine empirically and to re-evaluate the role of money in the major economic developments of the post-Civil War period. A chief reason for undertaking the study is that, despite significant advances in thinking about money since that time, present-day interpretations still commonly accept concepts and verdicts characteristic of the years 1865 to 1900.

The study is primarily concerned with testing three sets of hypotheses which are found in contemporary literature. First, the hypothesis that long price-level swings, specifically those occurring during the period 1865 to 1900, are monetary phenomena attributable chiefly to changes in the production of gold. Second, the idea that the quantity theory was valid and useful in explaining developments of the post-Civil War period — and perhaps up to 1929 — but is not very useful today because of a fundamental change in the behaviour of income velocity. Third, the view that short-run movements, i.e., business cycles, as well as the long-run trends are explainable in monetary terms. In general, the study seeks evidence which may afford clues as to the direction of causal forces.

Inasmuch as the three major hypotheses under examination are all fundamentally expressions of the quantity theory, it is necessary to define the quantity theory so that it has definite and specific meaning. Some of the difficulties in the way of clear definition are considered in Chapter II. The definition used is a narrow one, turning on the role of money in

economic stability, or instability. It is held that the central hypothesis of quantity-theory reasoning is that desired variations, or stabilization, of the price level may be obtained through monetary rules or policies, i.e., by monetary means alone.

Chapter III presents relevant factual and statistical data. The evidence is reviewed in Chapter IV, and final comments and conclusions are presented in Chapter V.

It is concluded that (1) the hypothesis that long price-level swings may be attributed to changes in world production of gold does not conform to the data. The facts do not justify singling out gold as the prime cause of price-level movements; (2) the idea that the behaviour of income velocity has changed in recent times is not borne out by the statistical data. The fact seems to be that the trend of income velocity has been fairly steadily downward, at least since 1880, although the rate has not been sufficiently steady to permit confident short-run prediction; (3) the "monetary disequilibrium hypothesis" and related views, which single out money, or the operation of the banking system, as the dominating causal influence in fluctuations of business activity, do not appear impressive in the light of the data. Contrary evidence appears much more imposing.

As to the direction of causal forces in general, the data indicate that money was essentially a passive rather than an active force, throughout the post-Civil War period.

The writer found no reason to believe, as is frequently suggested in contemporary literature, that the role of money in aggregate demand from 1865 to 1900 was fundamentally different from the role of money in the modern economy. He finds no reason to interpret the post-Civil War period in terms essentially different from those used to interpret modern developments. It is concluded that while institutional change has been significant, it has hardly been of such character as to require a duality of basic theory in explaining developments since 1865.

Microfilm copy of complete manuscript of 125 pages, \$1.56. Enlargements 6" x 8", 10¢ per page. Library of Congress card number MicA54-368.

#### THE NORTHWESTERN MUTUAL LIFE, 1857-1950: AN HISTORICAL CASE STUDY OF INVESTMENT POLICY AND PRACTICE

(Publication No. 7065)

Orange A. Smalley, Ph.D.  
Northwestern University, 1953

The life insurance industry of the United States at the close of 1950 represented one of the world's greatest aggregations of invested funds. The more than 600 companies which comprised the industry owned assets of almost \$64 billion in trust for more than thirty-five million policyholders. These institutions varied in size from those with assets of under \$1 million to those whose assets exceeded \$5 billion.

The ten largest of these companies owned, in the aggregate, over 60 percent of the total industry assets. The problems of investment for the managements of these ten companies differed substantially from those of the small companies, although, it is acknowledged, the varying conditions of business fluctuation affect all life companies similarly.

Sixth largest, measured by magnitude of investment, among the life insurance companies of the United States, is the Northwestern Mutual Life. Thus the investment policies and practices of that company constitute an interesting case study for those students of finance and economic development interested in the problems and management solutions of a giant life insurance company. In addition, however, to being one of the largest companies in the industry, the Northwestern has been characterized by certain attributes which have made it unique among the great life institutions. One of the most striking ways in which the Northwestern has differed from the rest of the largest companies in the industry is its geographic location. Whereas all the other industry giants are and have been located in New England and Middle Atlantic States, the Northwestern Mutual is a Middle Western institution, being located in Milwaukee, Wisconsin. This factor of location has presented the firm with investment opportunities and handicaps not simultaneously shared with its major contemporaries. Furthermore, it has played a significant role in the development and growth of the company and in the attitudes and business practices of its professional managers and Trustees.

The Northwestern Mutual was founded in 1857 in a region which had but recently developed beyond the frontier stage. Between 1857 and 1950 the policies and practices of the company's management in investing the funds of policyholders have changed with the development of the national and regional economy, and with the creation of investment opportunities. The problems successively confronting the firm's management have, as might be expected, been similar in kind over time but varying in degree.

This study is concerned with recording the development of investment management and policy in the Northwestern over a period of ninety-three years, and with interpreting the factors which have made the firm one of the leaders in its industry. The analysis is conducted within a framework of the significant time periods in the company's history. Within this framework is shown the growth and change in the composition of the Northwestern's investments, the particular problems faced, and the solutions which management applied to those problems. These factors are analyzed against a background of the changes in the economy of the United States, as well as the growth of the life insurance industry. In each of the major time periods the performance of the successive managements is evaluated in the light of the comparative records of the Northwestern's leading competitors. Particular attention is paid to such factors as net earnings rates, investment distributions, and variations in the exploitation of existing and new investment opportunities.

The source materials upon which the study is

based include both the original records of the Northwestern and the general and specialized publications of the industry, including service organizations, as well as the studies conducted by individuals and research groups and the records of public bodies. Important contributions have been made by the officers, employees and Trustees of the company. The work is the product of two years of intensive research during which time the writer has been accorded the fullest academic freedom by the Northwestern's management.

Microfilm copy of complete manuscript of 543 pages, \$6.79. Enlargements 6" x 8", 10¢ per page. Library of Congress card number MicA54-369.

## ECONOMICS, HISTORY

### THE DEVELOPMENT OF OLIGOPOLY IN THE FARM IMPLEMENT INDUSTRY

(Publication No. 6938)

Elvis Luverne Eckles, Ph.D.  
University of Illinois, 1953

This is an historical study of the growth and change in structure of the agricultural implements industry and is directed to the discovery of the forces determinative of the size, number and performance of firms. The theses explored are (1) that the structure of an industry at any time is the predictable result of a constellation of forces, motivations and institutions which have influenced key individuals in the industry, and (2) that the developed structure becomes a major determinant of future performance and structure.

About two-thirds of the study is devoted to description and analysis of the industry from 1830 to the present. In this, all available public and private sources are drawn on to trace the changes and discover their causes. Using this as a case study, a process of change in industrial structure is outlined:

1. A new industry tends to develop a competitive structure as easy entry encourages numerous firms of comparable size.
  - a. Independent courses of action, reflecting the characteristics of persons at the locus of control, are rewarded according to their success in satisfying wants.
  - b. An expanding market and ingenuity offset advantages of early start, patents or other restraints.
  - c. A desirable degree and type of competitive performance exists.
2. Impersonal competition for the market changes to personal rivalry for advantage.
  - a. Market expansion slows and stabilizes as fewer virgin territories and less important technological changes remain to be exploited.
  - b. Dominant firms emerge due to superiorities in resources, personnel, organization or policies.



- c. Firms fail in depression and consolidate in prosperity.
  - 3. Means for securing advantage tend toward the chaotic but lead ultimately to parallel action.
    - a. Fewness and disparity in size make independence impossible.
    - b. Parallel action takes numerous forms and offers superior rewards.
    - c. Fewness de-emphasizes market forces but magnifies activity of other firms, and with disparity in size, leads to one-way interdependence.
  - 4. A stable industry structure appears, characterized by fewness, size, diversity in product and conservative policies.
    - a. New rigidities develop: only under special conditions do firms enter or leave the industry; policies become more efficient toward fixed goals but less flexible.
    - b. A disproportionate amount of innovation is by minor firms.
    - c. Growth of major firms is channeled into non-competitive fields.
    - d. Industry structure does not provide the conditions prerequisite to effective competition.
    - e. Structure and performance are reciprocally related.
  - 5. Government action facilitates these developments.
    - a. Consequences are not foreseen or are foreseen and approved.
    - b. Accepted standards to measure divergence from desired conditions are not available.
- Power in the market is the key to the ability of large firms to choose the manner and timing of innovation or adaptation. This power rests on size and adaptability of productive plant, volume of financial resources, widely known name, extreme diversification of products, integration forward to a dependent dealer organization, extensive use of credit in selling, and a tendency to preserve and protect the existing industry structure by seeking growth in other areas. The recommendations for dealing with this situation are:
- 1. To encourage new firms and independent action by maintaining a broad market for product for all firms.
  - 2. To give equal if not preferential treatment in fact to new and small firms.
  - 3. To divorce manufacturers from the financing of sales.
  - 4. To divorce manufacturers from dealers.

Microfilm copy of complete manuscript of 299 pages, \$3.74. Enlargements 6" x 8", 10¢ per page. Library of Congress card number MicA54-370.

## THE POSTWAR DEVELOPMENT OF THE FOREIGN TRADE IN SOUTHEAST ASIA, 1946-1952

(Publication No. 6997)

Chi-Tsu Wang, Ph.D.  
University of Illinois, 1953

### The Approach and Scope of this Study

This study is intended to examine certain aspects of the postwar development of foreign trade in countries of Southeast Asia (1946-1952), both theoretically and empirically. In other words, this study attempts, in the first place, to investigate the subject in the light of the macro-economic analysis. Secondly, it is also intended to base its findings on the empirical evidence, both statistically and historically.

The study treats the postwar development of foreign trade in Southeast Asia as a "regional study." Nearly all the countries in this area possess certain common features in their economy and foreign trade, such as the predominance of agriculture, the pressure of population on resources, and the low productivity and income per capita. Therefore, they may be treated as a "group" or "region" in terms of these common features or elements.

The Southeast Asia region includes the following countries or territories: British Borneo, Burma, Ceylon, China(Taiwan), Hongkong, India, The Associated States of Indochina, Indonesia, The Federation of Malaya and Singapore, Pakistan, The Philippines, and Thailand.

The Study contains six chapters. Chapter II describes the general trade movements of this region in the postwar years, chronologically and statistically. Chapter III is intended to make a statistical analysis in regard to the production and exports of the principal primary commodities in Southeast Asia after the war. Chapter IV is devoted to a rather theoretical analysis of the causes and effects of external economic instability in countries of this region as well as in other underdeveloped countries. Chapter V deals with certain aspects of the postwar commercial policies of Southeast Asian countries and other underdeveloped countries in regard to restoring equilibrium of the balance of payments and to mitigating the price fluctuations of primary exports. Chapter VI endeavors to discuss some aspects of the role of foreign trade in the economic development of underdeveloped countries, including countries of this region. Chapter VII summarizes the main findings.

### General Summary and Conclusion

The most important problems regarding the foreign trade of the region after the war were the shortage of foreign exchanges, the generally unstable and unfavorable terms of trade, the external economic instability, and the adverse balance of payments.

The underlying causes for this unfavorable situation in this region can be attributed partly to domestic factors such as the low level of production and exports, over-specialization on a few primary exports, the substantial expansion of imports and the rapid growth of population. It is also partly due to external factors such as the violent fluctuations of external

demand and price for primary exports and the generally low price and income elasticity of demand for these exports.

Most of these difficulties, indeed, may be overcome to some extent as "Balanced Growth" economic development proceeds. However, the vexing problems of acute balance of payments difficulties in the early stage of economic development and the increasing population pressure still remain to be solved.

Ideally, the difficulties of the last two problems may be eased to a considerable degree through foreign capital and technical assistance. However, the forthcoming of any seemingly adequate amount of foreign investment is generally not so easy as expected for various reasons. Therefore, it appears that economic development of countries in this region under the prevailing world conditions may have to depend largely on domestic efforts and foreign trade.

In conclusion, foreign investment, economic development and foreign trade are the three interlocking factors. The tempo and future of any one will be largely determined by that of the other two.

Microfilm copy of complete manuscript of 251 pages, \$3.14. Enlargements 6" x 8", 10¢ per page. Library of Congress card number MicA54-371.

## ECONOMICS, THEORY

### SOME THEORETICAL ASPECTS OF ECONOMIC DEVELOPMENT AND THEIR APPLICATION TO AGRICULTURE IN UNDER-DEVELOPED COUNTRIES

(Publication No. 6918)

Jyoti Prasad Bhattacharjee, Ph.D.  
University of Illinois, 1953

The study is divided into two parts. The first part deals with some of the theoretical aspects of economic development, while the second part is confined to an application of these theoretical aspects to the field of agriculture, particularly, in underdeveloped countries.

The first part starts out with a discussion of the historical perspective to the current issue of development of underdeveloped countries. The two concepts, economic development and economic growth, have been discussed, defined, classified and reconciled.

An inquiry into the general conditions, economic and institutional, of economic development has then been undertaken, with the help of a new model of economic growth. It has been concluded that there is likely to be more than one possible equilibrium rate of growth of an economy. Some other conditions were derived from a simplification of this model. It was seen that for equilibrium growth, real income, induced investment and consumption must grow at the same constant rate, that the inducement to invest

must be greater than the propensity to save, and that the rate of growth will be higher, the higher the values of the propensity to save, the inducement to invest and the productivity of investment.

A study of the general economic conditions of development revealed the important role of autonomous investment in the development of underdeveloped countries. Among the new conditions derived in this section, are that the rate of growth of resources over time must be greater than 0, and that the rate of extensive development must be greater than or equal to 1 and maximum. Under institutional conditions, the role that social, cultural, personality, political and historical factors play in the economic development of a country has been analyzed.

The second part of the study starts out with clarification of the concept and measures of underdevelopment. An attempt has then been made with the help of the ranking coefficient to compare the levels of consumption, production and economic development of 36 countries of the world. It appeared that 18 percent of the world's population live in highly developed countries, 16 percent in intermediately developed, and 66 percent in underdeveloped countries.

An attempt to appraise the use of resources in agriculture led to several conclusions. First, the economy of underdeveloped countries is dominated by the agricultural sector. Secondly, the proportion of active population employed in agriculture and the proportion of national income originating in agriculture tend to decrease as the level, both absolute and relative, of development of a country increases. Thirdly, improvements in the efficiency of labor in both agriculture and the rest of the economy seem to go together. An inquiry has then been conducted into the use of resources within agriculture in different countries, with the help of a logarithmic production function. The variables considered are the net agricultural income on one side and weighted arable land, population active in agriculture, fertilizer consumption and livestock. The general conclusion has been made that in order to maximize total net agricultural output in underdeveloped countries, reliance should be placed on the additional use of resource inputs other than land, man-power and livestock.

One of the general conditions of agricultural development discussed is that for total economic development to occur there should be growth and development simultaneously in the agricultural and the non-agricultural sectors of the economy. A study of the rates of growth of different countries of the world has been made and the preceding theoretical analysis made use of, to deduce the means of maximizing agricultural output in the world and in the underdeveloped countries.

Microfilm copy of complete manuscript of 215 pages, \$2.69. Enlargements 6" x 8", 10¢ per page. Library of Congress card number MicA54-372.



# GENERAL EQUILIBRIUM THEORY AND THE INCIDENCE OF SALES AND EXCISE TAXES

(Publication No. 6937)

Esther Virginia Duvall, Ph.D.  
University of Illinois, 1953

This thesis applies general equilibrium analysis to the problem of the incidence of sales and excise taxes. A non-mathematical approach to general equilibrium theory was used for the most part. Partial equilibrium analysis attempts to trace tax incidence through the geometry of cost curves and demand curves with modifications for the degree of competition and the length of the time period involved. Employment theorists approach the problem with the aggregative tools of income, employment, the supply of money, the demand for money balances, and marginal and average propensities to consume. This thesis is based on the idea that general equilibrium theory can add to the theory of tax incidence by (1) welding the two approaches into a cohesive whole, and (2) adding some insight into the problem through the concept of the interdependence of economic variables.

Chapter I lists the assumptions and defines the technical terms most commonly used in the body of the thesis. Chapter II describes the views of early and contemporary writers on tax incidence. Included are the writings of David Ricardo, E.R.A. Seligman, Antonio de Viti de Marco, Duncan Black, John Stuart Mill, Alfred Marshall, M. Slade Kendrick, A. C. Pigou, Harry Gunnison Brown, E. R. Rolph, John F. Due, Grenville Holden, James K. Hall, and Michal Kalecki.

Chapters III-IV analyze the incidence of an excise tax and a general sales tax under conditions of perfect and imperfect competition. In addition, the following cases are explored: (1) government expenditures unchanged by the imposition of the tax; (2) government expenditures increased by an amount equal to tax revenues and spent on (a) the consumption of market-valued products by government, (b) an increase in transfer expenditures, (c) the retirement of outstanding public debt, or (d) replacing other sources of revenue.

The thesis concludes that the relevant determinants of a general equilibrium system and, hence, the determinants of tax incidence are (1) the degree of competition (with particular reference to the mobility or substitutability of factors in any given time period), (2) the total supply of factors, (3) the form and level of government expenditures financed by the revenue from the tax under consideration. The following assumptions must be used to support the above determinants: (1) no change in individual tastes or preferences; (2) no change in the range of techniques of production available; (3) no change in the ratio of savings to consumption out of a given income except those changes induced by the tax.

The theory portions of the thesis have not been supported by empirical evidence. The gathering of sufficient data of this sort would be very nearly impossible.

Microfilm copy of complete manuscript of 119 pages, \$1.49. Enlargements 6" x 8", 10¢ per page. Library of Congress card number MicA54-373.

# COST CONCEPTS IN MARKETING: A STUDY OF THE APPLICATION OF THEORETICAL CONCEPTS OF COST TO THE EMPIRICAL DETERMINATION OF COST BEHAVIOR IN THE INDIVIDUAL MARKETING FIRM

(Publication No. 6981)

Robert Grimmer Seymour, Ph.D.  
University of Illinois, 1953

## Objectives of the Study

The objectives of this dissertation are to ascertain the extent to which the assumptions and reasoning of traditional economic theory can be applied to cost behavior in the individual marketing firm, which produces intangible marketing service(s), and to make suggestions which will be useful in carrying out empirical cost studies in marketing firms, within the traditional theoretical framework.

## Methodology

The method is largely deductive, involving theoretical analysis of the following:

1. Consideration of marketing as a production process, analogous to form production as contemplated in the traditional analysis.
2. Definition and consideration of basic theoretical concepts in a marketing context.
3. Examination of the practical problems of reconciling the empirical cost data of the marketing firm to the static model.
4. Evaluation of existing marketing cost studies.

## Review of Findings

Marketing is defined "as the double sorting involved in the application of marketing effort (the dynamic supply function) to market opportunity (the dynamic demand function)." Production in marketing is the performance of order-getting and order-filling (marketing) functions in carrying on the double sorting process, but it is difficult to define output for purposes of analysis. The definition of output as "services rendered to customers" was found to be the most satisfactory. Marketing output is not complete until a purchase-sale transaction is closed. Outputs result from performing individual marketing functions, such as buying and storing, whether or not a sale is consummated. These outputs are termed intermediate outputs to distinguish them from the final outputs completed with the sale transaction in a marketing firm. Traditional theory is concerned with the final output concept.

A certain indeterminacy is found in the production function of the marketing firm, because the performance of the marketing functions does not necessarily result in sales transactions. Cost behavior patterns can be expected to reflect the indefinite

nature of the production function. Except for that condition, the laws of diminishing return and of returns to scale appear to operate, and external economies and diseconomies appear to exist in marketing firms as the traditional analysis would indicate.

The practical problems encountered in making empirical analyses include the determination of true marketing outlays from internal records of the individual firm, the measurement of output, and the measurement of the size of the firm. The best indication of rate of output as measured by dollar sales, gross margins, physical volume, or number of sales transactions handled by the firm in a given period, depends upon the requirements of the particular study. Output capacity is a useful measure of size of the firm, although the depth of the marketing operation must also be considered.

Costs of performing the order-getting functions, such as selling and advertising, are subject to a different set of determinants than are the order-filling costs. Selling effort induces changes in output and the induced output changes influence unit selling costs. It is suggested, therefore, that behavior of order-getting and order-filling costs be analyzed separately, before combining the two to derive curves of total marketing costs.

Selected existing cost studies in marketing are evaluated. The studies based entirely upon operating ratios for groups of similar firms do not conform to the assumptions and reasoning of traditional theory and, therefore, do not shed light upon marketing cost behavior in accordance with the traditional patterns. Statistical cost functions in marketing institutions have been derived in accordance with the fundamental assumptions and reasoning of traditional theory by Joel Dean and others. These latter studies point the way to substantial progress in determination of cost behavior in marketing and other service firms within the structure of traditional economic theory.

Microfilm copy of complete manuscript of 249 pages, \$3.11. Enlargements 6" x 8", 10¢ per page. Library of Congress card number MicA54-374.

## COMPETITION AND THE THEORY OF GAMES

(Publication No. 6838)

Martin Shubik, Ph.D.  
Princeton University, 1953

The role of the theory of cooperative and non-cooperative games in the study of oligopolistic competition is discussed. An examination of a 'price-variation' duopoly model leads to the formulation of the

problem of reconstituted demand in oligopolistic competition. Inventory problems are brought in and a 'price-quantity' variable duopoly model is formulated. It is shown that as the number of competitors increases in a 'price-variable' oligopolistic market, the prevailing price tends to that under pure competition although the 'Bertrand-Edgeworth cycle' or range of fluctuation still remains present.

The role of the state of information and communication in game theory and economic theory is examined. The necessary information state for pure competition is discussed. Definitions for risk, ignorance and indeterminacy in economic situations are offered.

We observe that the concepts of equilibrium offered by E. H. Chamberlin and Mrs. J. Robinson coincide with that of a non-cooperative game equilibrium point. Most of the market imperfections mentioned by Chamberlin and Robinson can be handled easily by non-cooperative game analysis and may be regarded merely as complications added to three basic non-cooperative game models. Other market imperfections are noted to be of a cooperative nature and hence require a completely different approach to that of the non-cooperative equilibrium theory.

Entry into competition can be treated as a type of 'ruin game.' This emphasizes the nature of the importance of financial conditions upon the survival of new firms. The power wielded by any large firm in oligopolistic competition is noted. Several examples are given.

The nature of a non-cooperative equilibrium point as a static phenomenon which has an objective existence of its own, but which may never be attained by the individuals in the economy is stressed. The possibility that many economic situations may not inherently possess any equilibrium state is discussed.

The nature of competition and collusion and some observations upon the concepts of profit and rent are made in the last chapter. The underlying stress of cooperative game theory upon the multitudes of different standards of behavior compatible with various economic situations is noted, and the future role of game theory as a tool for mathematical institutional economics is stressed.

Microfilm copy of complete manuscript of 279 pages, \$3.49. Enlargements 6" x 8", 10¢ per page. Library of Congress card number MicA54-375.



## EDUCATION

### EDUCATION, GENERAL

#### THE MASTER'S DEGREE IN CALIFORNIA

(Publication No. 6862)

William Winfield Armentrout, Ed. D.  
Stanford University, 1953

A study of the master's degree in California was undertaken to explore (1) the developmental status, (2) the existing institutional requirements, and (3) desirable requirement standards for master's degree programs in California institutions of higher education. Within this context the investigation is somewhat historical, descriptive, and to a somewhat lesser degree evaluative.

The inquiry is intended to provide a collection of information serving three major purposes: (1) the need for a greater interchange of ideas and information among all who are taking part in, or closely connected with programs of graduate study in California; (2) to benefit as much as possible the prospective graduate student in search of information for his own use in finding out what is being offered and required at the master's degree level in the many institutions of California; and (3) to bring forth increased awareness and thinking about variations or diversities in institutional master's degree requirements.

Data concerning the developmental history of the master's degree and early graduate study in California were gathered from published historical accounts and early college or university catalogs. Such information as conferring of the first master's degree in California by the College of the Pacific and early organized graduate study at the University of California were thus accessible to cross-checking between a secondary historical source and an appropriate college bulletin publication. Information concerning number of degrees conferred is based on data compiled by the United States Office of Education.

Reporting of institutional practices, graduate offerings, and master's degree requirements is developed through uniform abstracts reflecting data found in university, college, seminary, or school catalogs. Before final inclusion in the study, the individual abstracts for each of the 49 California institutions offering a master's degree during 1953 were prepared for approval or requested from the graduate dean or a similar official at each institution.

The portion of the study concerning desirable standards for master's degree requirements is based upon a tentative statement of requirement standards devised as a part of the study. The instrument, itself, relies heavily but not entirely upon inclusions and interpretations of previous recommendations for desirable master's degree practices prepared by the

Association of American Universities. Each item in this preliminary statement was then organized in opinionaire form to provide for reactions of California graduate study officials in terms of "basic agreement," "partial agreement," "basic disagreement," or "undecided". Comments upon each item were encouraged. Following an analysis of returns in which 39 of the 49 institutional representatives responded within a two-month period, a revised statement of desirable master's degree requirement practices was prepared.

Among the study's findings a proportionately greater demand for master's degrees recently than for either bachelor's or doctor's degrees is reported, both in California and the nation. Some 194 major subject titles (not including 50 additional concentration titles within the single field of Education) under which graduate study is offered in 49 California master's degree-granting institutions are catalogued by field of study and institutions offering such study.

Implications of the study suggest requirements for master's degrees, such as thesis, comprehensive examinations, and foreign language, should be justified in terms of the institution's purpose and in making the best use of a student's time during the one or two years of academic study prescribed for a master's degree. Uniformity among institutions should not eradicate purposeful diversity in educational practice, but rather should enhance standards of competence and focus upon what is to be expected of the student who has earned some particular kind of a master's degree.

Microfilm copy of complete manuscript of 288 pages, \$3.60. Enlargements 6" x 8", 10¢ per page. Library of Congress card number MicA54-376.

#### THE HEALTH TEACHINGS AND PRACTICES DERIVED FROM THE HEBREW BIBLE

(Publication No. 7088)

Lewis Leon Berlin, Ph. D.  
New York University, 1952

##### Background of the Study

This study presents and analyzes the physiological health teachings and practices that are found in and derived from the Hebrew Bible. The findings are viewed (a) as progressive developments in the religious life of an ancient people, some of whose health experiences are recorded in the Bible, (b) in comparison with related teachings of contemporaneous Near Eastern peoples, derived from their own and from archaeological sources, and (c), in the light of present-day standards for building positive health, and for avoiding ill health through non-medical preventive measures. This study also offers

basic educational principles for instituting a coordinated community-wide program in health education for both children and adults.

#### Sources, Materials and Methods

The basic health data for this study are found in the Hebrew Bible and in the authoritative expository texts and traditional commentaries. Translations of Egyptian, Assyrian, Babylonian and Canaanite sources provide the comparative data. These are interpreted in terms of prior antecedence, motives, and health influences from and upon each other – all in the light of meaningful geographical, cultural and human interrelationships. Since this is an historical (rather than a controlled-experimental) investigation, each of the five aspects of physiological health are compared, point by point, on the basis of the historical sources.

#### Findings and Their Analysis

**Proper Food:** The biblical Jews enjoyed a much more varied, balanced and wholesome diet than their contiguous neighbors. They ate such items as vegetables, fruits, cereals and grains, fats and oils, milk and dairy products, fish and meat – in fact all foods which authorities consider indispensable for good physical health. For various historic and religious reasons, they rejected meat and milk in combination, fishes that lack scales and fins, fowl that have hooked beaks and gripping talons, animals that lack split hoofs and (at the same time) do not chew their cud, animals found dead or wounded, insects, crustaceans, rodents, blood, and animals and fowl not slaughtered in a manner that, in post-biblical times, was labeled the *Shehitah* process. On the other hand, Jews were cautioned to avoid gluttony and intoxicating drink taken to excess.

**Physical Activity:** There were outdoor games for children, military-combative skills for the youths, and occupational tasks for the adults. Work was considered both desirable and healthful. Recreation, primarily in the form of music and dancing, was frequently indulged in, especially at festivals.

**Somatic Rest:** The Sabbath (once a week) and additional Holy Days and holidays are set aside during the year for complete physical rest and abstinence from work. This healthful regulation was unique for the biblical Jews.

**Personal Hygiene:** The Jews integrated personal hygienic habits with purity of thought and with religious observance – in a concept termed *holiness*. Through frequent compulsory washings of the hands, feet and body, through repeated cleansings of the clothes, and through healthy practices in feminine hygiene, they became an habitually clean people. No other contemporary nation was similarly morally required to abide by such hygienic standards.

**Avoidance of Illness:** The biblical Jewish community was safeguarded by regulations about the disposal of waste, sources of drinking water, circumcision, and the prompt burial of the dead. There were also salubrious regulations in reference to lacerating and tattooing the skin, prostitution, incest, and sodomy. It may also be conjectured that the Bible recognized the communicability of certain dis-

eases, and to prevent their spread set up controls of inspection, observation, isolation (of the victim), quarantine (of his home), and other precautionary measures.

Since it was every Jew's moral and religious duty to maintain good physical health, the priests were charged with the teaching, enforcing, and interpreting of the health laws. This duty included the supervision of personal and community health affairs. Unlike their counterparts in other lands, the Jewish priests did not employ magic, necromancy, sorcery, demonology, shamanism, witchcraft, or obnoxious pharmacopeia. Instead, they generally used pragmatically sound procedures that are in harmony with modern preventive care from a layman's standpoint. The biblical priests performed an added service to humanity by fostering the growth of health thinking from the earlier superstitious practices, through their own pre-logical but valid empirical experiences, to our modern scientific inductive experimentation.

#### Recommendations

In addition to determining and documenting the aforementioned health practices, the investigator also suggests a number of educational principles and procedures whereby scientifically accepted biblical health practices may be brought to the attention of (a) children in public and parochial schools, (b) adults in the homes, and (c) civic agencies in the community. This three-fold application of sound health teachings might well stimulate a greater striving for physical health through the emphasis upon each individual's religious and moral obligation to achieve and then maintain good health.

Microfilm copy of complete manuscript of 386 pages, \$4.83. Enlargements 6" x 8", 10¢ per page. Library of Congress card number MicA54-377.

#### A STUDY OF DIMENSIONAL ORIENTATION AS EVIDENCED THROUGH THE SPEECH OF CHILDREN IN NURSERY SCHOOL, KINDERGARTEN, FIRST AND SECOND GRADES

(Publication No. 7020)

Lura Minni Sota Carrithers, Ph.D.  
Northwestern University, 1953

#### The Problem

It was the purpose of this study to obtain information as to the amount and nature of dimensional orientation and of factors associated with the dimensional orientation of children in nursery school, kindergarten, first and second grades as evidenced by their talking. Specifically, answers to the following questions were sought:

1. To what degree are children who are beginning to express their feelings and thoughts through talking, expressing:
  - a. Orientation of no dimension
  - b. two-dimensional orientation



- c. multi-dimensional orientation
- d. change-of-mind-on-second-thought from two-dimensional to multi-dimensional, or from multi-dimensional to two-dimensional orientation?
- 2. Are there any relationships between the types of dimensionality expressed and:
  - a. chronological age
  - b. mental age
  - c. intelligence
  - d. sex
  - e. socio-economic status of the family
  - f. methods of discipline used in the home?

The answers to two additional questions were sought from a second, small group of young children.

- 1. Are there relationships between the types of dimensionality found and factors included in the Interest Inventory:<sup>1</sup>
  - a. number of interests
  - b. preferences
  - c. wishes
  - d. sleep
  - e. fears?
- 2. Can multi-dimensionality be taught to children of ages six to seven?

#### Methods of Procedure

In order to get the children to talk the experimenter devised a "test" of seventeen pictures which represented the children's interests. The pictures were spread out on a table to which the children came individually or in small groups.

Their talking was recorded on a tape recorder and later transcribed and analyzed as to the dimensionality expressed. The scoring of the experimenter was validated by two clinically trained psychologists.

The subjects for this study were 368 children attending nursery school, kindergarten, first and second grades, in public and private schools in the vicinity of Evanston, Illinois. They represented various socio-economic levels and were of groups from which no level of intelligence had been removed. A questionnaire was sent to the children's teachers in order to find information regarding the socio-economic status of the family and methods of discipline used in the home.

An additional group of twenty first grade children attending the Children's School of Northwestern University during the summer session of 1952 was selected for seeking answers to the two additional questions of this study.

#### Major Findings

The major findings of this study are summarized as follows:

- 1. The children of this study expressed themselves significantly more in terms of dimensions than in terms of non-dimensions.
- 2. There were a few more two-dimensional than multi-dimensional expressions found but the difference was not statistically significant.
- 3. A few of the children changed their minds on second thought. The number of those who did not

change their minds was significantly greater than those who did.

- 4. Significantly more non-dimensional than dimensional terms were found to be used:
  - a. among the 2.6 - 4.5 year age group of children
  - b. by girls than by boys.
- 5. Children of the 2.6 - 4.5 year chronological age group expressed themselves significantly more in non-dimensional terms than in any other groups.
- 6. Statistically significant changes-of-mind were found:
  - a. among the 6.6 - 7.5 chronological age group
  - b. among the 8.6 - 12.5 mental age group.
- 7. An association, significant at the .05 level, was found between the types of dimensionality and intelligence but the nature of the association was not evident.
- 8. An association, significant at the .01 level, was found between the types of dimensionality and the socio-economic status of the family. The nature of the association was not evident.
- 9. No significant association was found between the types of dimensionality and methods of discipline used in the home.
- 10. No significant relationships were found between the types of dimensionality designated in this study and factors revealed through the Interest Inventory, on the basis of this study made with only twenty children during a six-week period.
- 11. Multi-dimensional orientation was not taught successfully to the experimental group of twenty children at the first grade level during the six-week summer session.

1. Paul Witty, et al., "Northwestern University Interest Inventory: Primary," (unpublished, 1952).

Microfilm copy of complete manuscript of 185 pages, \$2.31. Enlargements 6" x 8", 10¢ per page. Library of Congress card number MicA54-378.

#### REVISING A HIGH SCHOOL CURRICULUM

(Publication No. 6926)

Morris Berdyne Cierley, Ed. D.  
University of Illinois, 1953

This is an action-research type of study conducted over a four-year period for the purpose of revising the curriculum of Summit High School. The two major assumptions upon which the work was based were (1) the subject-centered curriculum of Summit High School needed revision, and (2) in order that it might be meaningful and stable, this change in curriculum must be accomplished through a change in people. After a statement of purposes and assumptions, the account of the study continues with a description of the setting for the study, including the community, the teachers, the school, and the curriculum at the time the study began.

The principal, who is the person instigating the research, then outlines his tentative plans for working with the central office, the staff, students,

graduates, and lay persons in order to achieve curriculum change.

Chapter II discusses the implementation of the plans outlined in the first chapter. A rather full discussion of the methods of working with the staff includes an analysis of teachers' attitudes and abilities; an explanation of the sociometric position of the teachers; a discussion of the ethics involved in producing change, with criteria for insuring the rights of teachers; and an examination of the points of contact between principal and teachers which might be used in effecting change. Descriptions of staff meetings, meetings of small groups, and individual conferences held during one school year show how each situation contributed to curriculum development. An account of various activities involving citizens of the community shows how the principal made use of existing channels of communication to disturb the equilibrium of community thinking with regard to the school. The second chapter concludes with a list of changes observable at the end of the first two years of the study and rather specific plans for the next year.

Chapters III and IV describe further implementation of plans during the two years following, again giving specific instances in which the principal worked with the central office, the staff, students, graduates, and lay persons to achieve curriculum development. Observable changes and plans for the succeeding year are included at the end of each chapter.

The final chapter summarizes changes that have been made and offers the conclusion that the curriculum has been improved. Improvements in the teaching-learning situation and in the experiences of students are used as a focus for presenting evidence to support this conclusion. Evidence is also presented to show that the faculty has grown professionally and that a better understanding of school problems has been developed in the community.

Another section of this chapter is devoted to a brief description and analysis of the failures encountered during the study.

The chapter concludes with some observations relating to method. Experiences at Summit indicate that in that given situation, limited results in curriculum revision were realized more rapidly through changes in the faculty brought about by conferences with individuals, departmental meetings, and the addition of new personnel. Attention is also called to the importance of working within the group, maintaining high morale, and developing leadership skill.

Microfilm copy of complete manuscript of 304 pages, \$3.80. Enlargements 6" x 8", 10¢ per page. Library of Congress card number MicA54-379.

## AN EVALUATION OF TEACHING JOB FINDING AND JOB ORIENTATION

(Publication No. 7091)

Edward Richard Cuony, Ph.D.  
New York University, 1953

The purpose of this investigation was to evaluate the effectiveness of a course in job finding and job orientation, which was taught to an experimental group of seniors in the High School at Geneva, N.Y., during the second semester of the school year 1950-51.

One year after graduation, the experimental group were better satisfied with their jobs, had been employed a larger part of the time, and had earned higher average wages than the equated control group of students who had not had the course.

On the Hoppock Job Satisfaction Blank No. 5, the mean raw score of the experimental group was 22.14; of the control group 20.09. Statistically, the probability is 99 to 1 that this difference was not due to chance. What this difference means may be illustrated by the following ways in which the experimental group differed from the control group in their replies to certain questions:

1. Twenty-seven percent (27%) more of the experimental group said they "liked" their jobs, or were "enthusiastic" about them, or "loved" them.
2. Thirty-three per cent (33%) fewer of the experimental group said they had thought seriously about changing their current jobs
3. Sixty per cent (60%) fewer of the experimental group said they would like to change both their jobs and their occupations.
4. Five students in the experimental group said they would not exchange their jobs for any other; there were no such students in the control group.

The average student in the experimental group, who had the course, was employed for 49.26 weeks; the average student in the control group was employed 47.91 weeks. The probability is 68 to 32 that this difference was not due to chance.

The average student in the experimental group earned \$39.34 a week during the weeks that he was employed, while the average student in the control group earned \$35.94. The probability is 92 to 8 that this difference was not due to chance.

The average student in the experimental group earned a total of \$1950 during his first year after graduation from high school, while the average student in the control group earned \$1729. The probability is 94 to 6 that this difference was not due to chance.

The total earnings of the thirty-five students in the experimental group for all the weeks that they were employed were \$68,240. The total earnings of the thirty-five students in the control group were \$60,521. The experimental group thus earned \$7719 more than the control group.

The total cost of teaching the course, including instruction and overhead, is estimated at \$1542. If we may conclude that the superior earnings of the experimental group were caused by the course in job



finding and job orientation, then a community investment of \$1542 in this course enabled these students to earn \$7719 more than they would have earned without the course. If these additional earnings may be considered a community asset, then the community collected a profit of \$6177 on an investment of \$1542 and simultaneously produced a group of young workers who were better satisfied with their jobs.

Both the experimental and control groups of students came from the same class of the same school, and entered the same labor market at the same time. The groups were equated by sex and by random sampling. The equating procedure was pre-tested on three previous classes; it produced groups which differed negligibly on the criteria, when neither group had the course.

The course was carefully planned to meet the specific needs of students in Geneva, N.Y. In general it followed the principles recommended and it employed certain of the techniques described in Hoppock's *Group Guidance*.<sup>1</sup>

1. R. Hoppock, *Group Guidance*. 1949. McGraw-Hill Book Co., New York, N. Y.

Microfilm copy of complete manuscript of 186 pages, \$2.33. Enlargements 6" x 8", 10¢ per page. Library of Congress card number MicA54-380.

#### ADAPTING GUIDANCE SERVICES TO JUNIOR HIGH SCHOOL NEEDS

(Publication No. 6864)

Lane Edward De Lara, Ed.D.  
Stanford University, 1953

This study reviews the further development of guidance services in the San Francisco Junior High Schools since the Eurich Report of 1941. A review of this and related studies indicates that junior high students' opinions about the guidance program have been generally overlooked. A second purpose of this study is to sample junior high school students' opinions as to their adjustment problems, to sample teacher and counselor opinion as to how well the guidance program meets the needs of the students and then present a recommended guidance pattern for the San Francisco Junior High Schools.

The technique for the gathering of the data necessitated the development of two opinion sampling forms. One of the forms was for use with the students and the other for use with the teachers and counselors.

The basic data of this study comes from three sources: (1) school records, reports, and direct observation supply the data that presents the material of the present junior high school guidance program, (2) data regarding selected areas of students' needs were obtained by an open end type questionnaire. A sampling of 208 boys and girls was obtained. The students' responses collected anonymously, indicate that these youth consider that certain areas of living constitute problems to them. The responses

also indicate which persons in the individual's environment he would choose to discuss these problems with him. (3) the study also presents certain data collected by questionnaire, observation, interview, and the evaluation which teachers and counselors make of the present guidance program. In general, students and teachers are inclined to agree that the present guidance program fails to meet many student needs. The program operates most efficiently in dealing with students' educational problems. It fails to meet the needs of students in many personal and home centered areas of living. On the basis of all of these data, certain conclusions were drawn regarding the effectiveness of the program.

A recommended pattern for a junior high school guidance program is presented in the final chapter. This pattern is not wholly a direct outgrowth of this study, but is closely related to the findings of this report. Throughout the year as facts accumulated and inferences were drawn regarding guidance needs and services, they have been used in the development of this pattern. It is felt that this pattern meets many of the needs that were uncovered in this study. It is also felt that this program overcomes some of the weaknesses of previous practices and in many ways is the kind of a program which those who participated in the study would recommend. This program is in the form of a series of goals and provisions for achieving them. The goals are those which were agreed upon by teachers and counselors at Marina Junior High School. The practices are those which have been tried and found successful.

As a counselor working with boys and girls during their three years of junior high school, the writer is convinced that the guidance program must be in a continuous process of evaluation and change if the needs of the students are to be met. As a result of this study, several areas worthy of further research were pointed up. Some of these areas were as follows:

1. The importance of the peer culture in the life of the adolescent cannot be overestimated. Studies in this field are vital and much data is yet to be uncovered.

2. The boys who participated in this study indicated that the area of "boy and girl relations" contained many of their major adjustment problems. Parents, teachers, and counselors were of practically no help to the boys in solving these problems. Some method or technique of helping the boys through this difficult period of adjustment is in order.

3. Seven out of ten of the problems that students talk over with teachers and counselors are in the area of "school". This reveals a situation that is far from adequate if one believes, as the writer does, that a guidance program should meet all the needs of a child. To increase the sphere of influence of teachers and counselors presents an inviting area of research.

4. It was evident as a result of the data presented that the relations between teachers and counselors left much to be desired. Techniques of establishing better rapport between these two groups presents a worthy area of study.

5. The role of the teacher in the guidance program is still in the moot stage and more research in this area is necessary.

Microfilm copy of complete manuscript of 182 pages, \$2.28. Enlargements 6" x 8", 10¢ per page. Library of Congress card number MicA54-381.

#### DEVELOPING GUIDANCE SERVICES IN A SMALL CITY SECONDARY SCHOOL SYSTEM

(Publication No. 6870)

Lloyd Norman Garrison, Ed. D.  
Stanford University, 1953

The study was undertaken in a particular secondary school system consisting of a junior high school, grades seven to nine, and a senior high school, grades ten to twelve, to: (1) provide the data which accurately describe pupil personnel services in the city's secondary schools; (2) to assess attitudes and opinions on these services from students, parents, and teachers; (3) evaluate these services against the criteria of authoritative recommendations; (4) propose a pupil personnel services program which would be both adequate and practical for the city's secondary schools; and, (5) develop a method for evaluation of guidance services in other schools.

Since it was impossible to contact all students, parents, and teachers individually for interviews, five instruments were prepared. Four of these were questionnaires and one was an instrument of evaluation composed of criteria established from the authoritative literature of the field.

Development of the instruments and the sampling procedures used are discussed in Chapters I and VII. A detailed account of both the data collected in this particular school and the process of the evaluation are reported in Chapters III, IV, V, and VII. Literature related to the development of guidance services and the survey movement is reviewed in Chapter II; and, a proposed program of guidance services for this particular school is presented in Chapter VI.

In a sense the study is a school survey, in which not the total program but the guidance aspects of the program have been the foci of investigation. The methodology of the survey has been a mixture of observation by an outside consultant, the researcher in this case, the cooperative participation of a committee of local professional people, and the application of criteria proposed by authoritative literature in the field. Specific methodological techniques have included observation, interviews, committee discussion, questionnaire, and analysis of school records. This mixture of investigative methods does not yield data which can be analyzed by quantitative methods. Rather does it yield data which must be synthesized logically. It is believed that this process involving the detached observations of an outside consultant, the application of authoritative criteria, and the pooling of the judgments of local people who have direct concern for the program under study forms a valid

basis for evaluating present activities and planning for future development. The data of the study apply to the one school system. The methods of the study apply to any school system which wishes to develop an evaluation of its guidance program.

Microfilm copy of complete manuscript of 177 pages, \$2.21. Enlargements 6" x 8", 10¢ per page. Library of Congress card number MicA54-382.

#### THE RELIGION OF COLLEGE STUDENTS WITH SPECIAL REFERENCE TO BRADLEY UNIVERSITY STUDENTS

(Publication No. 7147)

Edward Dwight Gates, Ph. D.  
Bradley University, 1953

The purpose of this paper was to gather factual data regarding the religion of college students. Specifically, the problem was outlined as follows: To ascertain certain religious beliefs, attitudes and practices of college students by (1) reviewing previous studies in the field, (2) sampling students at Bradley University, and (3) comparing the results of the Bradley survey with a similar study made at Harvard College and Radcliffe College, where substantially the same testing instrument was used. In general the findings were these:

1. Previous studies indicate that college students do have religious beliefs, and that, judging by their attitudes toward religion and their religious practices, such as church-going and prayer, they are religious. Some investigators maintain, however, that college students are not interested in religion *per se* and are woefully lacking in knowledge of the subject matter of religion. On the question of whether college effects any change in the religion of students, the investigators are divided. Furthermore, among those studied which do indicate a change there is no unanimity of opinion as to the nature and extent of such change. It does seem certain, however, that the overall effect of college is not such as to turn out graduates who are atheists or even agnostics.

2. In January, 1953, Allport and colleagues' Attitude Inventory on Aspects of Religious Belief was administered to 1,402 undergraduate students of Bradley University, representing nearly 60 per cent of the day undergraduate enrollment of that institution. The percentage of men and women, as well as the proportion of freshmen, sophomores, juniors, and seniors in this group of 1,402 students is about the same as in Bradley's total day undergraduate enrollment.

Some of the results of the Bradley survey are as follows:

On the basis of "felt need" for religion, orthodoxy of belief and frequency of devotional practices these students, as a whole, give evidence of being religious.

On the same basis it was found that:

1. Women are more religious than men,
2. Non-veterans are more religious than veterans,



3. Unmarried students are more religious than married students,
4. Non-transfer students are more religious than transfer students,
5. Younger students are more religious than older students,
6. Freshmen are more religious than seniors,
7. There are differences in "religiousness" among various major study groups,
8. Roman Catholic students are more religious than non-Catholics,
9. Sorority women and non-sorority women are more religious than fraternity and non-fraternity men.

The Attitude Inventory also inquired into the religious background and experience of the students. It was found, for instance, that most students report a change in their religious beliefs and feelings after they pass their fifteenth birthday, and that their parents, the church, and their friends are the most influential factors in determining their religious beliefs and attitudes. The students were also asked to indicate the effect of college experience on their religion. According to their own estimates, college experience has no effect on their religion and seldom makes them less religious. It would appear that the most pronounced effect of college is to make the students more interested in the problems religion seeks to answer.

3. Comparing the responses of the Bradley students to the Harvard-Radcliffe group it would seem that on the basis of "felt need" for religion, orthodoxy of belief and frequency of devotional practices, the Bradley students are more religious than the Harvard-Radcliffe students. The Harvard-Radcliffe study did not consider as many categories of differences as did the Bradley survey.

Microfilm copy of complete manuscript of 200 pages, \$2.50. Enlargements 6" x 8", 10¢ per page. Library of Congress card number MicA54-383.

#### COMPARATIVE STUDY OF TWO METHODS OF LEARNING THE KEYBOARD IN THE STUDY OF TOUCH TYPEWRITING

(Publication No. 7100)

Philip Sidney Gross, Ph.D.  
New York University, 1952

The purpose of the investigation was to compare two methods of learning the keyboard in the study of touch typewriting. One method consisted of conventional procedures for learning the typewriter keyboard, and the other method consisted of a visual association analytic approach employing a specially constructed keyboard learning device.

Three experimental groups were utilized in the study: Experimental Groups I and II, at the Walton High School, Bronx, consisted of 27 first-term high school girls and 22 first-term high school girls, respectively; and Experimental Group III, at the

William H. Maxwell Vocational High School in Brooklyn, consisted of 20 first-term high school girls.

Three control groups were utilized in the study: Control Groups I and II, at the Walton High School, Bronx, consisted of 27 first-term high school girls and 22 first-term high school girls, respectively; and Control Group III, at the William H. Maxwell Vocational High School in Brooklyn, consisted of 20 first-term high school girls.

None of the girls in the experimental and control groups had formal training or experience in touch typing prior to the beginning of this study.

The experimental training program utilized a visual association analytic approach designed by the investigator; the control training program utilized conventional typewriting methods.

A Keyboard Knowledge Test designed to measure knowledge of the keyboard, and three tests - Facility Tests 1, 2 and 3 - to measure facility with the keyboard, were utilized in this investigation.

The Keyboard Knowledge Test was administered to the Experimental Groups I, II, and III at the end of the third and eighth hours of the training program. The Keyboard Knowledge Test was administered to Control Groups I, II, and III at the end of the eighth hour of the training program.

Facility Tests 1, 2, and 3 were given to the experimental groups and control groups at the end of the tenth, twelfth, fourteenth, sixteenth, eighteenth, twentieth, twenty-second, and twenty-fourth hours.

The investigator compared (1) scores made by the control groups with scores made by the experimental groups in Facility Tests 1, 2, and 3 for speed at the end of the eighth, sixteenth, and twenty-fourth hours; (2) the means in the Keyboard Knowledge Test for speed for the control groups at the end of the eighth hour, and the Keyboard Knowledge Test for the experimental groups at the end of the third hour; and (3) scores made by the control groups with scores made by the experimental groups on Facility Tests 1, 2, and 3 (in terms of errors) at the end of the eighth, sixteenth, and twenty-fourth hours.

The following conclusions may be based on the results of this study:

1. At the end of the eighth hour, on Facility Tests 1, 2, and 3 which measure speed of typewriting for one, three, and five minutes, respectively, the experimental groups generally perform better than the control groups.

2. At the end of the sixteenth hour, on Facility Tests 2 and 3 which measure speed of typewriting for three- and five-minute periods, respectively, the experimental groups generally perform better than the control groups.

3. At the end of the sixteenth hour, on Facility Test 1 measuring speed for one-minute duration, there is no difference between the experimental and control groups.

4. At the end of the twenty-fourth hour, on Facility Tests 1, 2, and 3, there are generally no differences between the experimental and control groups.

Microfilm copy of complete manuscript of 148 pages, \$1.85. Enlargements 6" x 8", 10¢ per page. Library of Congress card number MicA54-384.

**AN INQUIRY INTO THE ROLE OF  
HISTORY TEXTBOOKS IN IMPROVING  
UNDERSTANDING OF HUMAN ACTIONS**

(Publication No. 6951)

John Wagner Hanson, Ph. D.  
University of Illinois, 1953

It is important to any society that its members understand the actions of other persons. This understanding must be learned. As a learning expected of all, the development of this understanding is appropriate to include in the general education program in schools. A particularly suitable field for developing this understanding is the study of history – in other words, the study of past actions of persons. Inasmuch as American history is generally required of all students in senior high schools, this subject appears to be available for the development of such understanding. If American history is to be used for this purpose, however, it is important that history textbooks now in use be examined to discover their potential usefulness in developing some understanding of human actions.

This study is an examination of a sample of high school American history textbooks to discover how well they employ and illustrate what is currently known about human actions. Three separate analyses were made. The first of these was a value analysis based on the process developed by Ralph K. White. The values discovered by applying this process to explanatory passages in history textbooks were then examined for their usefulness in understanding action by interpreting their frequency of appearance, their relation to human needs, and the patterns of values which appear to predominate. The second analysis was a search in the historical explanations for those principles which are generally accepted in the discipline of psychology as helping to understand actions. A list of psychological propositions to be used as a basis for this analysis of history textbooks was drawn up by collating principles and concepts appearing in nine psychology textbooks. A search was then made in history textbooks for illustrations of the use of these principles as explanations. The third analysis was to determine how comprehensive textbooks are in explaining individual actions and how well they illustrate each of the constructs in a theoretical model of an action. As a basis for this analysis, a model was used which included the constructs of temperament and capacity, descriptive beliefs, value beliefs, needs, goals and the behavior space perceived by the actor. The explanations of actions were now examined to determine both which constructs and how many constructs were used in explaining single actions.

These analyses showed that American history textbooks are replete with partial "explanations" of single actions but that the textbooks themselves do little to collate these explanations or generalize from them. Furthermore, while the textbook sample revealed some use of almost all the propositions and constructs which were used as bases for the three analyses, these propositions and constructs which

were used were so interlarded with historical narration that they were observed only when attention was focused upon them. This suggests that if history textbooks are to be used to improve understanding of human actions it is important that they be studied with the aid of schemes which will call specific attention to factors which help understand actions. The fact that the processes of value analysis, psychological proposition analysis, and analysis by means of a psychological model were fruitful in discovering constructs which help understand actions suggests that these are processes which might appropriately be adapted for use by high school students and tested as instructional methods aimed at improving understanding of actions.

Microfilm copy of complete manuscript of 170 pages, \$2.13. Enlargements 6" x 8", 10¢ per page. Library of Congress card number MicA54-385.

**THE COLLEGE PREPARATORY PROGRAM  
IN A SMALL HIGH SCHOOL**

(Publication No. 6875)

Emil Brevard Jones, Ed. D.  
Stanford University, 1953

The main concern of the early American secondary school was the teaching of Latin grammar with the specific purpose of preparing students for college. The main function of the American secondary school continued to be preparation for college until the beginning of the present 20th century. While this is no longer true this function of the secondary school is still vitally important.

The purpose of this study was to make a partial evaluation of the college preparatory program in the Paso Robles High School, Paso Robles, California. As a basis for the evaluation the Cooperative Achievement Tests were administered to all the students in some selected subject matter areas. This preceded a follow-up study of the graduates who had matriculated at one of twelve selected colleges and universities in California to determine their success in college as a measure of the effectiveness of their high school preparation.

Some appropriate teachers were asked by questionnaire to make an estimate of the potential qualifications of each graduate for college work.

These questionnaires were then used for comparative purposes with the actual number of graduates who attended college. Another aspect was the comparison of Paso Robles graduates with the graduates of twelve selected California high schools which were to serve as a criterion group in judging whether Paso Robles was sending an optimal number of graduates to college each year. The last step in the study was a personal appraisal of the graduates' total social and academic records compiled during their high school careers as a measure for judging their future performance.



### Summary of the Results and Conclusions

The college preparatory program in the Paso Robles High School is functioning effectively. The following results of the data gathered are used to support this statement:

1. The Cooperative Achievement Test results showed that the current Paso Robles students' mean scores in English IV, Algebra II, and Biology were above the mean scores of the national norm groups and that the difference between these scores was significant at the .01 level for English IV and the differences approached the .05 level for Algebra II and Biology. The mean score for the English III students was not significantly different than that of the national norm groups. The mean scores of the students in the Plane Geometry, Chemistry, United States History, Physics and Algebra I classes were below the mean scores of the national norm groups and the difference between these scores was significant at the .01 level for Plane Geometry, Chemistry, and United States History. The differences between the means approached the .01 level for Algebra I and the .05 level for Algebra II, Biology and Physics.

2. The mean grade point averages of the Paso Robles graduates in the selected colleges were above that of a "C".

3. The teachers' estimates of the percentages of graduates who should have gone to college were close to the actual percentages of graduates who went to college. These percentages were greater than the actual percentages of graduates going to college from the selected high schools.

4. The appraisal of the graduates' total social and academic records seemed to indicate that these students were "successful" while in high school in terms of a well rounded program of scholarship and extra-curricular activities.

It would seem from the results of this study that American high schools should become more concerned about their college preparatory programs and should examine them to determine whether or not they are encouraging the optimal number of their graduates to go to college.

Microfilm copy of complete manuscript of 118 pages, \$1.48. Enlargements 6" x 8", 10¢ per page. Library of Congress card number MicA54-386.

### A DETERMINATION OF CERTAIN CHANGES IN PARENTAL UNDERSTANDINGS, ATTITUDES, AND INTERESTS AS COMPARED WITH THOSE OF THEIR HIGH SCHOOL CHILDREN FOLLOWING A TEACHING UNIT IN ATOMIC ENERGY

(Publication No. 6961)

George Coe Lorbeer, Jr., Ed. D.  
University of Illinois, 1953

The purpose of this study was to determine whether high school youth who are instructed in a regular

teaching unit, and encouraged to relate the information therein to their adult associates, will show appreciable gains in understandings, attitudes, and interests and these gains will be associated with comparable gains in their parents.

A two week unit on atomic energy was conducted in a high school in Glendale, California while another secondary school served as a control. Emphasis during the unit was on the constructive or peacetime uses of atomic energy. Motion pictures, charts, booklets, and a basic pamphlet were the main materials used while lecture-discussions, questions and answers, free discussions, and student reports were the major teaching methods employed.

An initial survey of the parents of the experimental and control groups by personal interviews or questionnaires was disguised so that the parents would not associate the original survey with the local high schools. No significant differences were found between the two information-gathering techniques.

The students of both groups were given a pre-test and after the teaching unit at the experimental school a post-test. Following the final test a follow-up survey was made of both parental groups. All questions on the student tests and parental surveys were identical although the forms were varied.

The basic questions were grouped around five sub-sections which sought to sample the scientific facts, social understandings, interests, values, and opinions each respondent had in the area of atomic energy at the onset of the undertaking and again at its termination.

Chi-analysis was the main statistical device used although "t" test of significance ranges, standard deviations, and mean scores were also employed. A subjective treatment followed the analysis of the objective data.

The writer found that there were no significant differences between the matched groups of students or between the parents of the experimental and control groups on the original evaluation instrument. Analyses after the final student tests and parental surveys had been completed showed that at the 1 per cent level of confidence:

1. The experimental students had made significant gains in each sub-section and on the whole test.

2. The experimental parents had made significant gains in each sub-section and on the whole test.

3. The control students had made significant gains in each sub-section and on the whole test.

4. The control parents had made significant gains in some of the sub-sections and on the whole test.

5. The gains of the experimental students were significantly greater than the gains of the control students in each sub-section and on the whole test.

6. The gains of the experimental parents were significantly greater than the gains of the control parents in each sub-section and on the whole test.

Twenty-one factors, the minor hypotheses, were studied to see what effect each had on this school-home communication. The particular sex of the student, the sex of the parent contacted, social class, birthplace of parents, scholastic abilities of the

children, formal education of the parents, number of siblings in the home, etc., were isolated but no significant differences were found at the 5 per cent level of confidence.

Because of the significant gains of the parents, low correlations between the students and their parents during all phases of the study, and the items of the minor hypotheses disproven, the writer examined the top quartile of parents in gains made to see what differences, if any, existed between this top group and the total group. Only two factors seemed to be important. They were:

1. Low original scores on the original parental survey
2. "Close" student-parent relationships.

Microfilm copy of complete manuscript of 149 pages, \$1.86. Enlargements 6" x 8", 10¢ per page. Library of Congress card number MicA54-387.

#### THE GUIDANCE PROGRAM IN SELECTED NEGRO INSTITUTIONS FOR HIGHER EDUCATION

(Publication No. 7011)

Frederick J. D. McKinney, Ed. D.  
Indiana University, 1953

The purpose of this study was an attempt to make a survey of the guidance program in selected Negro institutions for higher education. It was felt that the evidence gathered would aid college administrators in setting up a guidance program, aid in the expansion and improvement of current programs, acquaint college administrators with guidance services and activities in other institutions, help to determine to a degree the present status of guidance in the several Negro institutions, contribute to the general knowledge of Negro higher education, and provide information for those who desire to become counselors and guidance workers. In so far as could be determined, this is the first study of this type to be made of the guidance program in Negro institutions for higher education.

The problem undertaken was to discover by personal visits and interviews the guidance machinery and personnel practices in 37 higher institutions for Negroes in the southern area of the United States. The training, experience, salaries, professional status, and personal traits desired were also investigated.

An interviewer's guide sheet was drawn up, submitted to criticism and revised to include an outline of the information wanted. Visits were made to twenty-two institutions and the guide sheets were sent to five schools and returned. Various types of colleges were included such as liberal arts colleges, teachers' colleges, agricultural and industrial colleges, publicly supported and privately supported institutions, coeducational and other institutions.

Organized guidance services in institutions for Negroes are not especially well developed. Seven

different titles were found for the chief guidance official in the 27 colleges. Ages of the chief guidance official ranged from 28 to 63 years with an average of 37 years. Six doctor's degrees are held and 26 master's degrees. Most of the officials are members of the N.E.A. Over one-third had from 11 to 15 years of experience in teaching before going into personnel work. Eight of the officials rank as professor, one-third of them as associate professor. The median salary is \$4650 per year, the range from \$2400 to \$7500. They consider training in guidance as the most useful type of preparation. All have private offices and maintain office hours for an average of 29.5 hours per week. Fifty-eight per cent have held office for 3-6 years and only 20 per cent for seven years or longer. Staff members number 223 and carry ten different titles. To improve the work there are needed a better understanding of student personnel work on the part of the administration, better personalities of staff members, and a clearer classification of responsibilities. Most of the heads are directly responsible to the president; they have much general college committee work and many relationships with other college officials. Entire responsibility for many functions and shared responsibility for many others are commonly found. The most common problems coming to the personnel office are scholastic achievement, finances, study habits, social maladjustment, and emotional problems. Personnel heads feel they accomplish most by personal counseling of individual students and least by use of faculty counselors. In-service training of staff members and general faculty in relation to guidance seems to be badly needed.

Microfilm copy of complete manuscript of 219 pages, \$2.74. Enlargements 6" x 8", 10¢ per page. Library of Congress card number MicA54-388.

#### THE DETERMINATION OF THOSE FACTS AND UNDERSTANDINGS WHICH SHOULD BE SECURED BY BUSINESS COMMUNITY SURVEYS: (INCLUDING A SUGGESTED METHOD FOR OBTAINING THESE)

(Publication No. 7138)

Virginia Ernestine Moore, Ed. D.  
New York University, 1953

This study was undertaken for the purpose of discovering which of the facts and understandings necessary for the improvement of business education can be secured through the use of community surveys of office occupations, and to develop questions by which to obtain this information.

In order to determine what information the projected questions should be designed to procure, certain specified literature in the field of business education was read and a list was made of all problems mentioned; the list was sent to twenty well-known persons in the field of business education with the request that each check those questions which he



felt should be included in a community survey of office occupations and add any items he felt had been omitted; the additions were made into a supplementary check list and sent to the members of the "jury" for checking in the same way as the original list.

Reading was done on the subject of questionnaire construction, a first draft of the questionnaire was made and presented to two persons for suggestions, and changes were made on the basis of their suggestions. Draft number two was mimeographed and distributed to eight businessmen who filled out and discussed it. The revised blank was presented to a specialist in business education and a number of changes were made as the result of his suggestions. The fourth draft was given to an expert in questionnaire construction and to two graduate students in the field of business education, and changes were made on the basis of their comments. Draft number five was reproduced and given to a workshop in business education at New York University for them to fill out and comment concerning.

A pilot study was made, using the form resulting after the fifth draft had been revised. The data obtained were tabulated and interpreted.

Draft number seven was reproduced by lithography and a validating survey was made of the Newark, New Jersey, chapter of the National Office Management Association. Changes made as the result of the validating survey were incorporated into draft number eight, the final complete draft.

The question blank developed was much too long for a typical survey; therefore, the questions were divided into a set of three questionnaires and into a set of four questionnaires, to be used in three, or four, successive surveys.

Because of the nature of the project, findings, as such, were limited to three. They were:

1. There are certain facts and understandings which are necessary for the improvement of business education, these being represented by the two check lists used in this study.

2. Not all these facts and understandings can and should be secured through the use of community surveys. The twenty-two items used as a basis for the questions developed in this study represented those which can and should be so secured, according to the jury of twenty well-known business educators.

3. It is possible to devise questions designed to obtain these facts and understandings, as was done in this project, and these questions have been at least partially validated in one situation.

Recommendations for future research were two:

It is recommended that a project be undertaken, the purpose of which would be to determine the types of information that should be secured through a community survey of distributive occupations and to develop the questions to be used in the making of such a survey.

It is recommended that a study be made of the types of information which should be obtained from business education graduates and a suggested questionnaire be developed to elicit the desired information.

Microfilm copy of complete manuscript of 368 pages, \$4.60. Enlargements 6" x 8", 10¢ per page. Library of Congress card number MicA54-389.

# A STUDY OF THE EDUCATIONAL ACTIVITIES OF SELECTED INDUSTRIAL, COMMERCIAL AND PROFESSIONAL FOUNDATIONS

(Publication No. 7056)

Charles Harold Nichols, Ph.D.  
Northwestern University, 1953

The objectives of the study were to discover the organizational and administrative pattern of a new type of foundation, to canvass and evaluate its educational activities, and to point the educational opportunities of the new type of foundation for business, industry and the professions.

Thirty-five foundations were selected for intensive study. These were foundations linked to some commercial, industrial or professional field, and they were foundations which gave an educational emphasis to their programs. In every instance they were non-profit, eleemosynary organizations, tax-exempted by the United States Treasury Department.

Questionnaire survey, analysis of foundation literature and visitation were the techniques employed. Twenty-one of the foundations were visited during the course of the study. For the evaluative phase of the investigation, twelve well-known adult educators from the ranks of the Adult Education Association expressed their judgments concerning educational goals, practices and issues of the selected foundations.

It was discovered that the new-type foundation had developed after 1913, the date of the federal income tax law, largely because of tax exemption privileges granted to individuals in 1916 and to corporations in 1936. These privileges made it possible for both individual and corporations to deduct, from federal income tax returns, contributions to federally approved eleemosynary institutions, up to certain legal limits. Pursuing a policy of intelligent self-interest, not inimicable to the public good, many individuals and corporations began to support newly created foundations which were rendering a vocational service to their own occupational fields.

As distinguished from the older, more traditional American foundation, it was further discovered that the new type of foundation is typically supported in a continuous fashion by some one occupational field and actively carries on its own program within that field. In most instances, it is not merely a fund-granting organization, as was the traditional type of foundation. Many specific characteristics of the new-type foundation are described in the dissertation.

Educational objectives of the thirty-five foundations studied were found to fall within the limits of six major goals: to advance the occupational field

of the foundation, to improve it by direct educational effort and, indirectly, by subsidizing such effort, to assist the field through dispensing information and counsel, to perpetuate the field through student recruitment and assistance, and to strengthen the field by developing greater public understanding and acceptance for it.

Toward the accomplishment of these goals, the foundations were found to be engaging in twenty-seven specific educational activities, largely in the area of adult education, specifically vocational and professional in nature. In generalized terms, these activities include: research, dissemination of research findings, compilation and distribution of field literature, information and counseling services, specialized training schools, various types of student aid programs, educational conferences, vocational guidance, speaker services, subsidization of college faculties or building programs, production of audio-visual aids, consumer and public education, model rooms, award programs, teaching aids, and similar functions. These various activities were found to meet special educational needs as they existed in the occupational area.

The panel of adult educators endorsed all goals and activities with the exception of award programs and teaching aids for the public schools. In effect, therefore, they endorsed the overall conclusion of the study, namely, that the new-type foundations are rendering valuable educational services to the occupational fields that created them, thus contributing indirectly to the public good, which justifies their continued existence. Commercial, industrial and professional groups supporting such foundations secure the benefits of a better trained personnel, a better informed and more receptive clientele, and planned progress within the field, all largely at the expense of the federal government through tax exemption privileges.

Microfilm copy of complete manuscript of 325 pages, \$4.06. Enlargements 6" x 8", 10¢ per page. Library of Congress card number MicA54-390.

#### AN EXAMINATION OF PROBLEMS RELATING TO STANDARDS OF VALUE JUDGMENT AS EXPRESSED BY A SELECTED GROUP OF BASIC COLLEGE STUDENTS

(Publication No. 6856)

James Preston Orwig, Ed.D.  
Michigan State College, 1953

#### The Purpose of the Study

The objective of this study was (1) to gain information concerning the types and frequency of problems students have relating to their value standards of truth, good, beauty, right and religion, and (2) to examine the sources in the college community where students feel they should receive help and where they feel they have received help relative to these problems.

#### Methodology of the Study

Data for the study were gathered by means of a questionnaire consisting of a check list of possible value problems and a check list of possible guidance sources. A Value Problems Check List consisting of 100 items was constructed allotting 20 items to each of the five value areas under study. Items within these areas were formulated on the basis of a common series of problems to permit comparison of student reactions to the areas. The presence of the five value categories was concealed from the student through randomization of items. The check list of guidance sources was so constructed as to elicit an appraisal of the guidance sources as they were associated with each value area in terms of potential and actual sources of guidance.

The study was based on a sample consisting of 522 freshmen and sophomore students of Basic College at Michigan State College. Data was summarized as means and percentages and numerous cross comparisons were made between the areas and items and six factors in the student population. These factors were sex, class, scholastic ability, general academic area, frequency of church attendance and father's occupation.

#### Major Findings of the Study

The major findings of this research were as follows:

1. The mean number of problems checked by the sample was ten. However, the distribution of the number of items checked per student showed that the tendency was for students to check very few problems, the median being seven.
2. In comparing the five value areas relative to check list responses it was found that somewhat more students checked items in the area of truth than in any other. It was also found that the mean number of items checked per student tended to be highest in the area of religion.
3. Individual items checked by 10 per cent or more of the sample suggested important general problem patterns for each of the value areas. These were a concern for the problems of clear thinking, a concern for the adequacy of goals and objectives in college and life, a concern for the adequacy of aesthetic judgment, and a concern for more knowledge and understanding with respect to religion.
4. Certain sub-groupings within the six student factors tended to check proportionately more problems on the check list than others. These were men, freshmen, students of average scholastic ability, humanities students, those regularly attending church students of lower level occupational backgrounds and students on farm background.
5. The study of the sources of guidance associated with value problems revealed that informal sources (parents, minister, books, friends, etc.) were checked with considerably greater frequency than formal sources (counselors, deans, advisors, etc.) both as agencies that should and do provide guidance. Parents as a source was consistently the most frequently checked of all sources by a wide margin.



6. In a scale judging the relative importance of value problems as compared with other kinds of problems, one-half of the sample asserted that such problems were among their most important concerns while one-third said they were not of major importance.

Microfilm copy of complete manuscript of 230 pages, \$2.88. Enlargements 6" x 8", 10¢ per page. Library of Congress card number MicA54-391.

**A STUDY OF THE OBJECTIVES  
IN HIGHER EDUCATION OF THE SIX  
LIBERAL ARTS COLLEGES OF  
THE CHURCH OF THE NAZARENE**

(Publication No. 7148)

Ralph Edward Perry, Ph.D.  
Bradley University, 1952

The purposes of this study are (1) to study the objectives, and the means for achieving them, as stated by official pronouncements of the several colleges and the Church of the Nazarene, (2) to survey the views of persons closely associated with the schools with regard to (a) the degree of familiarity with the objectives, (b) the emphasis the various schools place on the objectives, (c) the degree to which these persons are in agreement with the goals and aims, and (d) their opinion of the extent to which those goals are attained, and (3) to formulate suggested steps for the improvement of the educational program of these colleges.

The four major sources of information investigated and the nature of the procedure include the following:

1. The objectives of the six colleges as stated in the 1951-1952 catalogue for each institution were carefully studied.

2. An analysis was made of the objectives set forth in other printed materials such as descriptive literature, faculty studies, addresses and articles by key persons in college employment, and information contributed by administrative officers.

3. The Tentative Statement of the Philosophy of Education for the Church of the Nazarene was investigated to determine the objectives in higher education which are acceptable to the general church.

4. A questionnaire was sent to the president, trustee members, faculty members, selected alumni, and selected students of each college in order to secure an expression of opinion regarding the probable success or failure in attaining the pronounced ultimate goals.

The questionnaire returns furnished the basis for a large portion of this study.

Space was provided in the questionnaire for voluntary comments and suggestions. Many of these anecdotal statements are found in the Appendix. Generalizations and recommendations are made in the final chapter on the basis of data obtained. In brief, they include the following:

1. There is a community of thought between the general church philosophy of education and that of the several colleges. The wording is similar in the various statements of the objectives for the colleges.

2. Although a sectarian view is held by the colleges, there has been an increase in secular influence in recent years.

3. The organizational trend has been from the Bible training organization toward the liberal arts college.

4. The intent and purposes of the colleges have been under careful study in recent years by church leaders, college administrators, and college faculties.

5. It was discovered that 48 per cent of all persons responding are not as familiar with the college objectives as they might be. It is evident that there is work to be done in acquainting these individuals with the college aims.

6. Each college is in the process of studying its objectives and devising tools for evaluation. These studies are of recent origin in most cases.

7. The college enrollments have reached a peak and have started to decline. This is believed to be a thing since the physical facilities of the schools are not adequate for large enrollments.

8. It appears that the faculty members were more familiar with the college objectives than any other group excepting the presidents.

9. Data obtained show that there is strong emphasis on intellectual growth, moral and spiritual attainment, proportionate to lesser emphasis on social improvement, and weak emphasis on physical development and vocational guidance.

10. The trend over a period of years according to opinion expressed has been toward a more balanced emphasis on the various objectives.

11. A large proportion of persons indicated that they were in full agreement with the various college objectives. Those expressing disagreement generally stated it was not with the objective as such, but with the method and degree of achievement.

12. Forty-five per cent of all persons responding expressed opinion that the objectives were being achieved to a certain extent but that further study was needed with regard to the intent and purpose of the schools.

Microfilm copy of complete manuscript of 290 pages, \$3.63. Enlargements 6" x 8", 10¢ per page. Library of Congress card number MicA54-392.

**A JUNIOR HIGH SCHOOL SOCIAL STUDIES  
TEXTBOOK IN FOUR PROBLEM AREAS —  
LABOR, POLITICAL PARTIES,  
CONGRESS IN ACTION,  
AND THE UNITED NATIONS**

(Publication No. 7141)

David Herbert Reid, Ed. D.  
New York University, 1953

**The Problem**

The development of a junior high school social studies textbook in four problem areas — labor, political parties, Congress in action, and the United Nations.

Chapter I of the Investigation analyzes the problem in terms of determining content, teaching suggestions, and the application of reading and interest level formulae to the text.

The objectives of the text (taken from the Ten Imperative Needs outlined by the Educational Policies Commission), the need for this study, the justification for the selection of these four problems, and an analysis of the problem solving method complete Chapter I of the Investigation.

Chapter II outlines the procedure used by this investigator in the organization of material included in the text. Currently used textbooks were surveyed to discover their weaknesses in the presentation of the four topics of this document, the sources of material used in the text were identified, and reading level formulae were examined and applied to the text, in this chapter.

Chapter III, Related Studies, explains the different methodologies for the social studies that have been developed since the days of World War I. Selected works of Beard, Bobbitt, Rugg, Quillen and Hanna were outlined to show where the present study has its "cultural roots."

A detailed bibliography concludes Part I.

Chapter I, of the text, is entitled "Organized Labor." A modified story line that is designed to interest junior high students opens this chapter with an imaginary scene in the classroom. This chapter analyzes the reasons for organizing labor, business, and other groups for the advancement of the general welfare.

The history of several business and labor organizations, the leadership of these organizations, and the problems faced by these groups are discussed in terms that can be understood by junior high students.

Problems for further study and suggested readings conclude Chapter I.

Chapter II, "Political Parties," opens with the story of a group of students traveling to Washington to visit the Republican and Democratic National Committees in 1952. This chapter also shows the interrelationships that exist between local, state, and national political activity.

Chapter III, "Congress in Action," shows another group of students visiting Washington and observing Congress in action. The leadership, the historical background, and the problems that face Congress are discussed in terms of problem solving techniques

that can be used by the students in the classroom, Congressional hearings, lobbying, and other facets of the congressional machinery conclude this chapter.

Thought questions, problems for further study, and suggested readings immediately follow the text of Chapter III.

Chapter IV, "United Nations," unfolds a picture of the activities at the United Nations headquarters. The strengths and weaknesses of the UN, with suggestions for improving the UN, are explained in terms that are suited to young adolescents.

Problems for further study and a selected bibliography conclude this chapter.

Chapter V, "In Unity There Is Strength," is an explanation of the role of the student in school as he attacks basic social problems. This chapter urges students to "do something about these problems."

Group action leading to the improvement of the democratic way of life is the theme of the entire document.

Microfilm copy of complete manuscript of 290 pages, \$3.63. Enlargements 6" x 8", 10¢ per page. Library of Congress card number MicA54-393.

**A STUDY IN SOCIAL ACCEPTABILITY:  
THE RELATIONSHIP BETWEEN  
THE INCREASE OF SOCIAL ACCEPTABILITY  
AND THE INCREASE  
IN SOCIAL EXPANSIVENESS**

(Publication No. 7118)

Samuel Isaac Spector, Ph. D.  
New York University, 1953

The investigation hypothesized that there was an initial reciprocal relationship between social acceptability and social expansiveness; that the former could be altered by means of certain experimental group techniques; and that the end relationship between acceptability and expansiveness would show accordingly greater reciprocity. The Ohio Social Acceptance Scale was used to measure initial and end relationships. Of the five eighth grade classes taught by the investigator, the 8.4 class, showing the lowest average acceptability score, was chosen as the experimental class, while the 8.1 class, showing the opposite, was designated as the comparison class.

The children in these two classes were compared to 23,000 of their peers in the public schools of New York City in terms of I.Q., reading scores and arithmetic scores, and were found to be representative. Both classes were found to be highly comparable in terms of number, composition by sex, race, religion, extent of retardation, I.Q., academic success, reading index, socio-economic status, chronological age, age by sex, health, category choices, emotional climate, number of siblings in the family, place of children in the family, education of parents, membership in a group outside of school, possession of personal skills, and emotional stability.



The preliminary measurements, based on choices by opposite sexes, disclosed a 49.6 average point score in acceptability and expansiveness for the experimental class, and a similar average point score of 79.1 for the comparison class. They also indicated that one fourth of the experimental class assigned the neutrality rating of category number 4 to their peers. Low correlations were determined for initial relationships between social acceptability and social expansiveness: +.10 for the experimental 8.4 class and +.28 for the comparison 8.1 class, thus negating the first hypothesis.

The experiment, designed to test the second hypothesis, was conducted within the classroom for a period of five months, during which thirty sessions were devoted to the experimental class and fifteen to the comparison class. The latter, in a special project, constructed slides based on *Evangeline*. With the experimental class, in the preparation of an original play designed to show how children could become popular, the following techniques were used: Gradually increasing the size of the groups; rotating the membership of the groups; group planning; group creating and reporting; group discussing and expressing; group deciding; group evaluating; permissiveness; free interaction; investigator self-effacement; intrinsic motivation; constant reference to purpose; warming-up period; graduated situation; opportunity for leadership; continued evaluation; discussion of the qualities of acceptability; and role playing. The end average acceptability gain of 22.7 points or 46 per cent upheld the second hypothesis that acceptability can be altered.

A decreased end correlation to -.13 for the experimental class negated increased reciprocal expansiveness. Of predictive value were found to be the *r*'s between acceptability and I.Q., academic success, group membership and Steinman histamine tolerance ratings. A successful practical program for increasing acceptability was set up with groupings not based on sociometric choices and with principles and techniques applicable also to extra-school and adult social situations.

Microfilm copy of complete manuscript of 138 pages, \$1.73. Enlargements 6" x 8", 10¢ per page. Library of Congress card number MicA54-394.

**A NEW ABRASION METHOD FOR TEXTILE TESTING; COMPARISON OF EFFECTS OF THIS METHOD WITH EFFECTS OF OTHER ABRASION MACHINES; AND USE OF THIS METHOD IN TEXTILE TEACHING**

(Publication No. 6985)

Evelyn Emma Stout, Ed.D.  
University of Illinois, 1953

The purposes of this study were: (a) to design and have built a new type abrasion machine which is simple to operate and keep in adjustment, consistent in its performance, and more adaptable to various

teaching needs than machines now available; (b) to compare results of abrasion with the new machine with results from other abrasion machines on the same fabrics; (c) to try the new machine on different fabrics and with different abrasants in order to establish methods of use; and (d) to propose a method for operation of the new machine, and for its use in teaching textile classes and related work.

To fulfill these purposes two hypotheses were proposed for testing:

**Hypothesis No. 1.** - It is possible to design a machine for abrasion, relatively simple to operate and that abrades a sample large enough for a series of tests, which will (a) be consistent in its performance, and (b) have an effect on breaking strength and elongation similar to the effects of other machines.

**Hypothesis No. 2.** - It is possible to adapt such a machine for use on different types of woven fabrics by varying the weight on the abrading arm, the type of abrasant used, or the number of abrading revolutions.

An abrasion machine was designed, built, and tried. It was considered satisfactory for the specified purposes. A motor and ratiomotor were installed for electrical operation.

A test was devised to determine the consistency of performance of the new machine. The test was based on the statistical significance of the differences in means and variances of abraded and unabraded cotton sheeting.

To compare performance of the various machines four fabrics and three other machines were used. The fabrics were made, one each, of rayon, cotton, wool, and nylon. Other machines were: a Wyzenbeek Precision Wear Test Meter, a Taber Abraser, and a M.I.T. machine. Three abrasants were used on the new machine and one each on the other machines.

For each fabric an abrasion-to-rupture end-point was determined on each machine with its abrasant or abrasants. Eight equal abrasion intervals were established between zero and the rupture-end-point for each machine, abrasant, and fabric. Effects of abrasion were evaluated in terms of effects on breaking strength and elongation. All abrasion, breaking strength, and elongation tests were carried on under standard conditions of relative humidity and temperature.

Results are summarized below:

1. The new machine (Stout) was consistent in its performance.
2. The number of abrasion strokes or revolutions to reach the rupture-end-point varied widely for the different machines, abrasants, and fabrics.
3. Despite great differences in machines, abrasants, fabrics, and number of abrasion strokes or revolutions, final effects on breaking strength and elongation were similar for the Stout, Taber, and M.I.T. machines. Results with the Wyzenbeek were inconsistent with results from other machines.
4. Results from use of the three abrasants on four fabrics on the new machine indicate that it can be adapted for use on various types of woven fabrics by varying the weight on the abrading arm, varying

choice of abrasants, or varying the number of abrasion revolutions.

5. The following have been done: (a) a manual of operation for the new machine has been prepared, (b) improvements for the new machine have been recommended, and (c) uses for the new machine in textile teaching and related work, and problems for further study have been suggested.

Therefore, within the limits of this problem, (a) the hypotheses have been shown to be acceptable, and (b) methods for use of the new machine have been suggested.

Microfilm copy of complete manuscript of 202 pages, \$2.53. Enlargements 6" x 8", 10¢ per page. Library of Congress card number MicA54-395.

#### A SURVEY OF BUSINESS EDUCATION IN THE PUBLIC SECONDARY SCHOOLS AND THE PUBLIC JUNIOR COLLEGES IN THE STATE OF KANSAS

(Publication No. 7142)

Ralf Jay Thomas, Ed. D.  
New York University, 1953

This study was made to summarize the present status of business education in the public secondary schools and junior colleges of Kansas for the purpose of recommending improvement of business education in these schools. The author was concerned about the objectives of business education, business education curricula, student personnel and guidance practices, library and laboratory equipment, professional status of the business teaching personnel, administrative and supervisory policies, and teaching methods in business education.

Under the normative-survey method of research, the questionnaire appeared to be the most appropriate instrument to use in this investigation. Check lists, to be completed by administrators (superintendents and principals) and business teachers in the state, were carefully prepared and tested prior to general distribution. Responses were as follows: principal's, 34.8 per cent; superintendent's, 21.1 per cent; and, business teacher's, 42.5 per cent. In presenting the data collected, the schools were divided according to the Kansas Educational Directory into first-, second-, and third-class, based upon the size of the community.

The findings revealed that both the administrators and business teachers expressed the belief that business education can contribute to vocational and general or non-vocational phases of education. However, the curricular pattern for business education in the secondary schools throughout the state is fairly stereotyped, regardless of the size of the community, and consists primarily of beginning and advanced typewriting, bookkeeping and shorthand; only a limited number offer such non-vocational subjects as general business, business law, and consumer education. At the junior college level the most frequent

policy is to designate the business curricula as terminal and pre-business. The secondary schools and junior colleges can well afford to make individual studies of their business program to see if it is meeting the interests and needs of the students and the employing community. This is especially important since forty-five per cent of their students are enrolled in one or more business subject.

Only a limited number of schools in Kansas have functioning guidance programs, found primarily in the first-class cities. Maintaining cumulative records is the guidance practice most frequently indicated by the schools. Provision for a study of occupations, selective practices for students interested in vocational business education, placement, and follow-up are used in a limited number of schools.

Except for typewriters and duplicating machines, the number of office machines available for instructional purposes in most Kansas business departments is limited. A follow-up of former students, together with a business machines survey of the employing community, should provide helpful information in determining office machines that should be available for instructional purposes.

Because there is a strong tendency for Kansas business teachers to obtain both their baccalaureate and master's degrees from Kansas colleges (especially the two state teachers colleges) and universities, these schools have an important responsibility in seeing that their business teacher-training institutions should point out the importance of a second teaching field, professional reading, participation in professional and civic organizations, and participation in those extra-curricular activities commonly assigned to business teachers.

There seems to be a need for more adequate supervision of business education in the state. A qualified state supervisor of business education could do much to improve the status of business education in Kansas.

Microfilm copy of complete manuscript of 624 pages, \$7.80. Enlargements 6" x 8", 10¢ per page. Library of Congress card number MicA54-396.

#### TEACHER SELF-REPORTING TIME STUDY AS A METHOD OF APPRAISAL

(Publication No. 6887)

Burton Chatterton Tiffany, Ed. D.  
Stanford University, 1953

##### Purpose and Method

The purpose of this study was to explore a procedure for ascertaining how teachers use their time in the classroom. The aspects of teacher time utilization observed were teacher activity, school subject being taught, and pupils included in the activity. The possible effects of class size and double or single sessions on time utilization was investigated.

A time record card was developed with classifications for recording time spent on these aspects.



Teachers in grades one through six in several school districts in southern California were asked to make entries on the time cards for each of these classifications, at ten-minute intervals, for a five-day period. Usable records were returned by 94 teachers.

#### Selected Findings

The time these teachers had available for instruction was less than the national average. There was great variation among teachers in all aspects of time utilization.

Time equivalent to about one instructional day per week was taken up by activities which were not primarily instructional. For most of this time no subject was being taught. About one-third of this time no pupils were included in the teacher activity.

Directed teaching took about 35 per cent of the teachers' time; group instructional supervision, 15 per cent; individual instructional supervision, 8 per cent; and teacher presentation, 8 per cent. The division of time for subjects showed a range varying from 25 per cent for reading, 15 per cent for social studies and science, 13 per cent for arithmetic, to only 5 per cent for music, 3 per cent for art, and 2 per cent for writing. Over 60 per cent of the time was spent with all the pupils but less than 9 per cent with one or a few pupils.

Teachers of large classes (35 pupils or more) spent more time than did teachers of small classes (less than 30 pupils) with one third of the class; with no pupils; and on arithmetic, spelling, and health and physical education. They spent less time with one or a few pupils; using resources; and on language and music.

Double-session teachers, compared with single-session teachers, had a shorter instructional week, the difference amounting to nearly a day's time. They spent about 50 per cent more time for recess. For non-instructional supervision they used half again as much of their available time. They spent only about one-third as much time using resources, one-half as much on individual instruction, three-fifths as much on art and music, and two-thirds as much on social studies. They spent a larger proportion of the time they had available for reading, arithmetic, and spelling, but in no subject did they spend as much actual time as did single-session teachers.

#### Evaluation of Teacher Time Study Procedure

**Values.** The time study procedure makes available objective evidence regarding what takes place in the classroom; it provides information which can be used in determining needed administrative changes and in-service education; it makes possible comparisons of teaching procedures under differing conditions; it may bring to light problems not previously identified; it develops increased awareness of classroom practices; it provides a means of ascertaining the extent to which time requirements are being met; it supplies evidence which can be used in developing better public understanding of the educational program; it provides current information regarding specific situations.

**Recommendations.** When the teacher self-reporting time study procedure is used teacher cooperation should be secured to insure authentic results; adequate time is needed to develop familiarity with recording procedures; the types of information desired should determine the classifications; classifications should be definitive and recording procedures simple; data obtainable by other means should not be secured through a self time study; time cards should be developed for machine tabulation; period for keeping time records should be carefully selected; space should be provided for explanatory comments; results should be shared with those participating; appropriate follow-up action should be taken.

Microfilm copy of complete manuscript of 198 pages, \$2.48. Enlargements 6" x 8", 10¢ per page. Library of Congress card number MicA54-397.

#### A PLAN FOR A COORDINATED SPEECH AND DRAMA PROGRAM FOR THE UNIVERSITY CENTER IN GEORGIA: RECOMMENDATIONS BASED ON A SURVEY OF RESOURCES AND OBJECTIVES, AND ON OPINIONS OF STUDENTS AND EDUCATORS

(Publication No. 7143)

Roberta Powers Winter, Ed.D.  
New York University, 1953

The purpose of this study was to propose a speech and drama program suitable in its separate features to the institutions making up the University Center in Georgia and representative in its overall dimensions of a sound general speech and drama program at the undergraduate level. The study was based on conditions existing in 1951 and 1952, as determined from studies and observation of the investigator, and as reflected in the opinions of administrators, members of speech and drama departments, and students.

The University Center in Georgia, a corporation of seven educational institutions organized to promote and develop cooperative educational and research programs by the member institutions, by its existence and activities invited and encouraged the application of cooperative principles to any or all areas. The area of speech and drama exhibited features congenial to cooperative arrangements.

Check lists, inquiries, and observation evidenced that there was marked diversity in the number and scope of offerings, in personnel, and in resources in speech and drama at the several institutions. The existing programs and resources were listed as accessible components of a considerable pool for the University Center as a whole.

Interviews with administrators of the several institutions disclosed institutional concepts, boundaries, and plans which would necessarily shape, direct, and govern all proposals for cooperation.

A study of attitudes among administrators and instructors of speech and drama indicated that both groups would be willing to pool the diverse interests,

strengths, and courses available at the several institutions through exchange of students and faculty members and by means of cooperative arrangements.

A questionnaire administered to a representative sampling of the seniors of the several institutions gave evidence that fifty per cent or more of the students in the Center felt a need or interest for the following offerings: training in voice and diction, public speaking, a required speech course, a voice recording, use of the playback for self criticism, and taking part in a panel discussion. Need or interest for other offerings was expressed by a smaller percentage of the students.

A study made with the help of speech and drama educators throughout the United States afforded a list of courses and related opportunities, which, when rated by a group of administrators of institutions comparable in some ways to those making up the University Center in Georgia, was reduced to thirty-three items thought to be essential or quite desirable to an undergraduate program for institutions of these kinds.

Using the data described above, the investigator projected and proposed a program in speech and drama for the University Center in Georgia which would embrace available resources, increasing their scope by cooperative practices within limitations imposed by institutional objectives. Immediate steps were outlined for implementing the separate and overall programs, and recommendations for future development were made.

The plan of the investigation could be applied to speech and drama programs at any institutions forming a geographic cluster if standards of educators and needs of students urged economy and diversification by means of cooperation. The results of the various studies would be of interest to speech and drama educators and to administrators of similar institutions.

Microfilm copy of complete manuscript of 205 pages, \$2.56. Enlargements 6" x 8", 10¢ per page. Library of Congress card number MicA54-398.

## EDUCATION, ADMINISTRATION

### A STUDY OF ADMINISTRATIVE PRACTICES IN SELECTED BIBLE INSTITUTIONS

(Publication No. 7145)

Herbert Winston Byrne, Ed. D.  
Bradley University, 1952

#### The Problem

The problem presented to this study is as follows: What are the current practices in the administration of Bible institutions, and how are they to be evaluated in the light of acceptable criteria of administration in higher education on the undergraduate level?

#### The Purposes

1. To ascertain what are the current practices in the administration of selected Bible institutions on the undergraduate level
2. To determine criteria of evaluation for administrative practices in Bible institutions
3. To provide an instrument of evaluation to Bible school administrators
4. To help lay the foundation for more acceptable results in this field of endeavor

#### The Procedures Employed

A list of schools thought to be in existence was compiled from a variety of sources chief of which was the Accrediting Association of Bible Institutes and Bible Colleges. A preliminary survey of these schools was made to ascertain which of them would participate in the survey and provide information. Fourteen Bible schools, selected at random in four Midwestern states and one Far Western state, were visited and various administrative officers interviewed. An interview instrument prepared in the form of a questionnaire was used in the interviews to gather the information desired. Upon the completion of these visits, the data was tabulated and a summary of the facts of chief significance was compiled.

Fifteen schools, selected at random in thirteen states in various sections of the country, were sent the same instrument in the form of a questionnaire. Careful instructions were included with the questionnaire and a self-addressed stamped envelope was provided for the return. Eight schools returned the questions, but four of these did not respond in time to be included in the study.

Twenty catalogues of schools selected because of their general excellence were also consulted on specific points of emphasis, and these data were also used to supplement the information gathered in the personal visits.

Before interviews were made, the writer consulted the catalogues supplied by the schools to obtain all of the information possible first. Answers to approximately one-twentieth of the questions were obtained from the catalogues. A few answers were secured from student handbooks, brochures, and a variety of publicity material, but by far the large majority of the answers came in the personal interviews.

Success in obtaining free answers to the questions was due to a large extent to the promise of anonymity. Information of all kinds was obtained from a total of thirty-eight schools.

In order to provide a basis for evaluating the data criteria essential to good college administration were reviewed. These criteria have been established and recognized by successful administrators who over the years have learned by both observation and practice what constitutes sound administration. Such principles represent the best thinking and practice in this field. The primary sources of these criteria included the accrediting associations and studies of the past several decades in higher education. Comparisons were made in



order to determine areas of weakness and this in turn provided the basis for a few suggestions and recommendations.

#### The Findings

The divisions under which the data were presented fall into the following order:

- General Control in Administration
- General Administration
- Business and Finance Administration
- Operation Administration
- Academic Administration
- Faculty Personnel Administration
- Student Personnel Administration

Problems and Tendencies in Administration  
Introductory chapters included the origin, development, and influence of Bible institutions, previous studies in the field, and the problem, its scope and significance. A special chapter was included which presented criteria for the evaluation of Bible institutions.

The major finding of the study revealed the need of clearly drawn lines of responsibility among the officers of administration.

Microfilm copy of complete manuscript of 399 pages, \$4.99. Enlargements 6" x 8", 10¢ per page. Library of Congress card number MicA54-399.

### THE NATURE OF BUSINESS ENGLISH

(Publication No. 7072)

Carl Herbert Cummings, Ed. D.  
Northwestern University, 1953

The Nature of Business English is a definitive analysis of the English usage in business writing, designed to support curriculum adaptations for the teaching of business English. The point of view of the study takes into account problems of the stenographer in that dictation materials are analyzed prior to editing after transcription. The basic analytical device involves tabulations of frequencies of occurrences of sentence lengths, sentence forms, parts of speech, points of syntactical usage, opportunities for punctuation, and important points of orthography in business writing. The materials analyzed for this study are diversified samples of actual dictations by 66 dictators who dictated 298 letters composed of 1,634 sentences and 37,764 words.

Sentences used in business English were measured by word length and structure. Specific items tabulated included numbers of sentences used by dictators; average sentence lengths; classification of sentences as declarative, interrogative, imperative, or exclamatory; and identification of simple, complex, compound, and compound-complex sentence forms. The fact that business English sentences are longer and more complex than sentences used by average adult writers predicated the first curriculum adaptation of the teaching of business English. This factor led to consideration of special handling of

clause control and unity in writing.

Parts of speech are tabulated in standard categories - nouns, pronouns, adjectives, verbs, adverbs, prepositions, conjunctions, and interjections - so that the relative usage in business English can be compared to adult average usage as defined by Stormzand and O'Shea in How Much English Grammar. A detailed analysis of parts of speech in this study includes a breakdown of nominatives by case and classification; tabulation of the multiplicity of verb forms resulting from inflectional changes in their conjugation, nature, and tense; and the frequencies of modifiers and connectives. Differences in business English usage are used as a key to the determination of areas worthy of special emphasis in the business English curriculum.

Syntactical usage in business English was shown to derive first from the dictator but to require modification by the stenographer. Faults in unity, coherence, and grammar were tabulated in the study and analyzed to determine areas in which the stenographer should be exceptionally proficient. Valid comparisons of business writing with average adult writing standards are difficult in the area of syntactical usage; however, such comparisons are made wherever feasible in the study.

This study recognizes the punctuation and orthography are primarily a responsibility of the stenographers. For this reason no attempt was made in the study to determine whether dictators induced errors of these types into the materials of dictation. Instead, an analysis was made of opportunities for use of punctuation and for avoidance of its use. Points or orthography were discussed insofar as they seem pertinent to the materials of dictation.

Recommended curriculum adaptations for the teaching of business English cover areas for special emphasis. They do not consider particularly the possibility of omitting any portion of the basic English curriculum. The carry-over for stress in the subsequent business English curriculum, however, is definitely limited. In some areas complete mastery through automatization is recommended, while other areas require sufficient knowledge to recognize faults and to correct them through the use of references. A few areas of basic English may be omitted from the business English curriculum, provided that they are not essential to unity of the presentation. Specialized usages are excluded on the assumption that they will be the subject of on-the-job training. Inherent limitations of the study prevent consideration of writing styles, technical dictation problems, and format development. Accordingly, the study remains one concerned with the nature of business English.

Microfilm copy of complete manuscript of 205 pages, \$2.56. Enlargements 6" x 8", 10¢ per page. Library of Congress card number MicA54-400.

**CLASSROOM ACOUSTICAL CONTROL  
AND THE EFFICIENCY  
OF VERBAL COMMUNICATION**

(Publication No. 6865)

Martin Ted Dixon, Ed. D.  
Stanford University, 1953

The purpose of this study was to investigate and analyze some of the effects of acoustical conditioning of classrooms on the efficiency of verbal communication during the introduction of exterior noises which had been identified as being relatively common for schools on the San Francisco Peninsula.

Interest in the problem stemmed from recognition of interferences with verbal exchange caused by noises coming from trains, planes, automobiles, and children during playground activity. Investigation regarding frequency of occurrence of such disturbances and the behavior of room occupants indicated that some pupils and teachers in extremely noisy environments were taking considerable time from instructional activity waiting for noises to cease; others continued classroom work in competition with the distracting influences.

Contacts with the faculty of a school which was subject to extensive airplane noises and that had classrooms of which only some were acoustically conditioned resulted in information that exterior noises did not seem to interfere with verbal communication nearly as much in acoustically conditioned rooms as in non-conditioned areas.

As a result of preliminary investigation, a problem was delimited and a hypothesis defined which suggested that children with "normal" hearing acuity and children with hearing loss, as defined by health standards and measured by the pure-tone audiometer, were able to understand a greater percentage of consonant and vowel sounds, during the introduction of exterior noises, in rooms which have been treated for the control of sound than in rooms which have not been acoustically conditioned.

After the problem was defined, an experimental design was developed which provided for administering verbal articulation tests involving nonsense syllables to two groups of subjects in three different acoustical environments during the introduction of exterior noises. One classroom was used for all experiments. The interior surfaces were changed to provide for three different acoustical environments.

In order to minimize error due to learning involving English words, con-vow-con nonsense syllables were used in the articulation testing lists. The lists were systematically developed using related research which permitted value-balancing of the three different lists needed for the experiment. The nonsense syllables and exterior noises were recorded so that their introduction during the experiment could be controlled.

Two groups of subjects were selected. One was composed of twenty-two elementary children with "normal" hearing, while the other consisted of twelve elementary pupils with some measurable degree of hearing impairment. In an attempt to mini-

mize learning, extensive pre-experimental training was conducted in order to familiarize subjects with the exterior noises, the types of nonsense syllables, and the procedures to be used.

Extensive control and error elimination measures were taken throughout the experiment. The tests were administered on three successive days with the acoustical conditioning of the room being changed between testing sessions.

In order to determine the significance of the difference in group scores under any two experimental conditions, the null hypothesis was assumed and the mean of the difference between scores examined to determine its significance using the *t* technique for small uncorrelated samples. In all cases except one, the difference between each of the conditions was very significant. In the one case it was possible that the lack of significance as illustrated by a small *t* score could be attributed to the small size of the atypical group. The results of the statistical analysis are presented in Table 1.

TABLE 1  
CHANGES IN THE PERFORMANCE OF  
EXPERIMENTAL GROUPS UNDER THREE  
DIFFERENT ACOUSTICAL CONDITIONS

NORMAL HEARING GROUP (N-22)			
Room Conditions	Mean of the Differences	<i>t</i>	<i>P</i>
A and B	4.63	3.11	.005
B and C	9.0	7.02	.001
A and C	15.64	7.95	.001
HEARING LOSS GROUP (N-12)			
Room Conditions	Mean of the Differences	<i>t</i>	<i>P</i>
A and B	.83	.24	.13
B and C	13.0	5.19	.001
A and C	14.75	5.80	.001
Absorption Coefficient of Room Condition A - .072			
Absorption Coefficient of Room Condition B - .101			
Absorption Coefficient of Room Condition C - .263			

Microfilm copy of complete manuscript of 85 pages, \$1.06. Enlargements 6" x 8", 10¢ per page. Library of Congress card number MicA54-401.



# FINANCING OF SPECIAL EDUCATION IN CALIFORNIA

(Publication No. 6866)

George McCallin Downing, Ed.D.  
Stanford University, 1953

The present method of apportioning state school money for special education is based on excess cost with a maximum limitation. State aid for general education is apportioned on the equalization principle. Consideration is given to the ability of the district to support an adequate educational program. Excess cost reimbursement fails to consider the wide differences in the ability of districts to provide education. Excess cost reimbursement does not recognize differences in necessary expenditures for education at the various levels. Excess cost reimbursement fails to recognize the existing variation in expenditures required to provide for the many kinds and degree of handicap in the several types of special education programs. Therefore, the question of the desirability of applying the principle of equalization to the support of special education has been raised in this study.

Two sources of current cost information have been studied. Data on the cost of various special education programs in California for the school year 1951-1952 were taken from the Report of Excess Cost of Educating Exceptional Children filed by 506 California districts. Supplementary information was obtained from questionnaire responses from fifty representative districts. The purpose of the questionnaire was to identify the extent to which various budget categories were used in arriving at excess cost claims.

The extent of variation in expenditure, the lack of consistent expenditure patterns, and the varying abilities of districts to finance special education support the contention that apportionment of special education funds should be consistent with the principles of equalization. Districts making the least effort receive a proportionately greater reimbursement from the state when compared to those districts whose efforts in special education are extensive.

The failure of many districts to use accurately the various budget categories in reporting costs of special education makes it impossible to determine the actual cost for this instruction. The actual expense of offering physically handicapped and mentally retarded education is greater than reported by individual districts.

Foundation programs for education of physically handicapped and mentally retarded children comparable to those established for the apportionment of state monies for all education should be established to ensure a minimum special education program. District ability to finance special education should be recognized proportionately by the state.

By providing for apportionment on an excess cost basis for physically handicapped and mentally retarded education the state has established the principle of assistance for excessive costs. The state has not given comparable recognition to the require-

ments of physical facilities and equipment that are necessary to operate these programs.

To assume that children with special needs can function in a program that is relatively the same, and consequently which cost is relatively the same, is fallacious. If an adequate job is to be done in meeting the special needs of these children, recognition must be given to the uniqueness of the educational program planned for each of their special problems. As the needs of these children vary it is reasonable to assume that the cost of providing the kind of education will differ.

Data in the study clearly indicate that the present apportionment used for special educational services is not consistent with the concept of equality of educational opportunity basic to the apportionment of other state school money. Children with unique educational needs are not being given equal treatment. School districts are not being given equitable aid in providing the kinds of special education that the children need.

Microfilm copy of complete manuscript of 80 pages, \$1.00. Enlargements 6" x 8", 10¢ per page. Library of Congress card number MicA54-402.

# ADMINISTERING A RAPIDLY GROWING SCHOOL DISTRICT

(Publication No. 6867)

George Thomas Egling, Ed.D.  
Stanford University, 1953

From 1940 to the present the United States experienced population gains which exceeded expectations. The Far West, and California in particular, received the greatest share of the population increase. California's rapid growth was not distributed evenly throughout the State. Most of the people settled in the metropolitan areas and their suburban fringes.

The school system is one of the social institutions which has been affected by these changes. Many districts are disrupted and disorganized while adjusting to expansion demands. This is especially so of smaller districts which have limited administrative staffs. The administrator in charge of one of these school districts encounters a group of administrative problems which are not characteristic of school systems whose enrollments are relatively static. Administrative adjustment to rapid growth is the topic of this dissertation.

The purpose of this dissertation was: (1) to study administrative problems created by unusual enrollment increases; (2) to analyze growth problems and to provide solutions or programs of action which promised more desirable consequences than former practices produced; and (3) to formulate generalizations which may be used by administrators in other rapidly growing school districts.

Of the many areas of administrative concern which growth creates three problems were selected for study in the elementary school district in Walnut Creek, California. The problem areas were: (1) the formulation of a master plan for future expansion of school plants; (2) an examination of practices and needs of the central administrative staff; and (3) an examination of the administration of non-teaching personnel.

The research design utilized was the research survey and action research. The following procedures were used:

1. Data were collected from school personnel and community agencies.
2. The literature of school administration pertinent to the specific problem was consulted for criteria and guidance in solution formulation.
3. Stanford personnel were consulted for guidance purposes.
4. Programs of action were hypothesized which promised to improve local practice.
5. The proposed programs were submitted to the superintendent and the governing board.
6. Generalizations based upon the above studies were formulated for guidance for future practice.

To establish growth characteristics of the Walnut Creek area and the attendant effects upon the school system population trends were studied for the United States with emphasis upon California, Contra Costa County, and Walnut Creek. An understanding of the forces which produced population gains in this district was essential to long-range planning for school building expansion.

The programs of action apply specifically to the Walnut Creek School District; however, the methods used and criteria formulated are applicable to other small districts undergoing rapid growth. Two generalizations are made from this study:

1. Recommendations for staff needs in rapidly growing districts are best made by a person from outside the district who has had experience in large school systems. This person is in a position to determine objectively the district personnel needs. This service may be supplied by the Office of the County Superintendent, the State Department of Education, or educational consultants.
2. The formulation of a master plan for school expansion requires either specialized training or a thorough reading of the literature by a member of the school staff. If competent district personnel are unavailable for the studies essential to master planning or if state and county services are not provided, then educational consultants should be employed.

Microfilm copy of complete manuscript of 271 pages, \$3.39. Enlargements 6" x 8", 10¢ per page. Library of Congress card number MicA54-403.

# A STUDY OF CURRENT PRACTICES IN THE ADMINISTRATION, ORGANIZATION, AND TEACHING OF BUSINESS REPORT WRITING AND RELATED COURSES IN COLLEGES AND UNIVERSITIES OF THE UNITED STATES

(Publication No. 7033)

Richard Conrad Gerfen, Ph.D.  
Northwestern University, 1953

This study presents the results of an investigation of current practices and trends in the organization, administration, and teaching of courses in business report writing.

As its setting, the study has the business community's growing awareness of the importance of writing as a basic business tool, and the consequent demand for more effective collegiate training in the writing of business letters and reports. Although business letter writing courses have become fairly common in collegiate business curricula, business report writing courses have not been extensively offered by colleges and universities.

As the demands of business have become more insistent, however, a number of institutions of higher education have added business report writing courses to their business curricula, and others are contemplating doing so. There is a growing concern, therefore, as to the place and function of these courses in the undergraduate programs of students enrolled in collegiate business-school curricula.

The study has been predicated on the assumption that the further development and improvement of courses in business report writing should be guided by principles based upon a thorough knowledge of existing practices and trends. The study was planned, therefore, not only to bring together exhaustive data concerning what is currently being done, but also to lay the groundwork for the development of sound principles to guide those charged with the responsibility of planning and administering these courses.

Three questionnaires were used to obtain the basic data for the study. The first form was used to secure information about the prevalence of the courses and about their administration. It was sent to those in charge of business writing programs in 193 universities and colleges. Replies were received from administrators in 155 institutions.

A second form was designed to secure information about course content and teaching practices from instructors of general business communication courses - these courses in which the primary emphasis is on business letter writing, but in which some attention is given to business reports. This form was sent to 74 instructors; 62 returned completed forms.

The third form was designed to secure specific and detailed information about the course content and teaching practices in separate courses in business report writing, and to secure information about the instructors who teach these courses. It was sent to 90 instructors in 60 different universities and colleges; 72 completed and returned the questionnaire.

The questionnaire survey covered all geographic



regions of the United States. The data supplied on the questionnaires were supplemented in a number of ways. In many instances, respondents made available course outlines, syllabi, or problem materials. In addition, the author visited several schools, and had conferences with many of the leaders in the field of business writing.

The data are organized under four major headings: (1) the organization and status of business report writing courses in collegiate programs of business education; (2) business report writing teachers - and their problems; (3) the objectives and content of business report writing courses; and (4) instructional materials, procedures, and methods of evaluation. The first two of these sections contain information that may be of value to administrators and to those concerned with problems of teacher recruitment and supply. The latter two contain information of special value to those interested in the general improvement of business report writing instruction.

During the course of this study, the need for more educational research in the field of business report writing has become apparent. It is believed that a series of research studies in this field would pay dividends in the form of better teaching and greater student growth.

Microfilm copy of complete manuscript of 431 pages, \$5.39. Enlargements 6" x 8", 10¢ per page. Library of Congress card number MicA54-404.

#### A STUDY OF SUPERVISORY SERVICES FOR BUSINESS EDUCATION AS RENDERED BY DEPARTMENTS OF EDUCATION IN TWELVE SOUTHERN STATES

(Publication No. 7073)

Frank Murrah Herndon, Ed.D.  
Northwestern University, 1953

The purpose of this study was to determine the adequacy of supervisory services for business education that are now being provided by the state departments of education of twelve southern states and to determine the nature of those services that are not now being provided but which might be desirably provided.

The study sought answers to the following questions:

1. What business education services should be provided by state departments of education?
2. What business education services are being provided by the state departments of education?
3. What business education services are not being provided but should be provided by the state departments of education?

The study was limited to supervisory services to public secondary schools in Alabama, Arkansas, Florida, Georgia, Kentucky, Louisiana, Mississippi, North Carolina, South Carolina, Tennessee, Virginia, and West Virginia.

Services that should be provided by state depart-

ments of education were determined from relative ratings assigned to eighty services. Rating sheets were sent to a representative of each of the forty-eight state departments of education and to an equal number of business educators. Ratings of these services were received from thirty-four departments of education and from forty-three educators.

Data about services that are being rendered were secured by questionnaires completed by representatives of departments of education in each of the twelve states. Further, forms were sent to one hundred business teachers and one hundred secondary school administrators in each of the twelve states. Usable forms were received from 407 teachers and from 469 administrators. These forms provided data about services received, services not received, and services not received but desired by teachers and administrators.

The study presents analysis of services rendered by state departments of education, services not received by teachers and administrators, and services desired by teachers and administrators. The analysis is presented by states with a summary following the analysis of each state. A graphic recapitulation shows comparatively the status of supervisory services prevailing in the twelve states.

The analysis of state programs of supervisory services for business education was made by applying the criteria of eighty services. These eighty services are listed in the study in the order of importance as determined by the arithmetic means of ratings assigned by representatives of state departments and business educators. The listing appears in three groups, as follows:

Group I - Services Considered Most Desirable in an Efficient State Supervisory Program for Business Education (twenty-nine services)

Group II - Services Considered Desirable in Strengthening a State Supervisory Program for Business Education (forty-six services)

Group III - Services Considered Least Desirable in a State Supervisory Program for Business Education (five services)

The following are a few of the general findings of the study:

#### Services That State Departments Might Desirably Render

1. Each of the eighty services comprising the criteria is considered by representatives of state departments of education and educators to be more than slightly desirable.
2. Educators tended to rate services higher than did representatives of state departments of education.

#### Services Rendered by State Departments of Education

3. State departments reported that from twenty to seventy services are being rendered.

4. The departments of education in Louisiana and Virginia render the largest number of services, and the services rendered by these two states are received by a majority of the teachers and administrators.

5. In ten of the twelve states, none of the services is received by a majority of business teachers or school administrators with the exception of one service in Arkansas, one service in Georgia, three services in Mississippi, and one service in Tennessee.

#### Services Desired By Teachers And Administrators

6. Except for Louisiana and Virginia, states are neglecting to render services that are desired by a majority of the teachers and/or administrators.

7. In all states teachers expressed greater desire for services than did administrators.

Microfilm copy of complete manuscript of 322 pages, \$4.03. Enlargements 6" x 8", 10¢ per page. Library of Congress card number MicA54-405.

### THE ROLE OF THE COUNTY SUPERINTENDENT OF SCHOOLS IN CALIFORNIA

(Publication No. 6874)

Justus Roland Ingraham, Jr., Ed.D.  
Stanford University, 1953

Evolving from a clerical and enforcement agency of the state, the office of the county superintendent of schools in California has developed into a position of educational leadership and service since it was established almost 100 years ago. The duties of enforcement have been expanded, but a newer concept of service has begun to develop in recent years. These two characteristics of responsibility typify the manner in which county superintendents of schools function in California today.

Established during an era of rural and isolated communities, this office has accumulated numerous duties and responsibilities out of necessity and from inclination. The effect of mandatory and permissive legislation and the individual interpretations expressed in the fifty-eight counties have resulted in a variety of administrative patterns at the county level, in inequality of educational opportunity, and in criticism by persons within and without the profession.

To define the role of the county superintendent, a comparison of the performance role with the legal role was made by selecting sections of the California Education Code applicable to the county superintendent of schools and restating these in the form of questions to make up a structured interview of 139 questions. Answers given by twelve representative county superintendents revealed a broad range in the variety of practice which exists in spite of a single code of law applicable to all.

This variety of practice may be attributed to the county superintendent of schools and the environment within which he operates. Factors influential in this respect are the leadership ability and educational philosophy of the county superintendent, the legal interpretation furnished by the local district attorney, the apportionment of county school service

funds to the individual counties, and the effect of popular election.

Within this frame of reference further variation of practice could be attributed to ignorance of the law, interpretation of the law, disregard of the law, and combinations of these factors.

Issues raised by this study concern the responsibility of the county superintendent as an arm of the state, a local agent, or a combination of both, the delegation of authority and responsibility to clerical and professional members of the staff, the lack of uniformity as an essential characteristic of county school administration, the present and future roles of the county superintendent.

A new concept of the county superintendency found in the historical development, the review of related literature, and in the actual practice of county superintendents reported in the structured interview is indicated. This county superintendent possesses professional qualifications and holds the highest credential offered by the state, delegates authority and responsibility to professionally trained administrative and supervisory staff members, leads in the cooperative development of a county-wide program of education, develops his program with the assistance and advice of the districts within his county, and makes the services of his office available to all districts.

Extending the practices of county superintendents expressed in the emerging pattern of operation, the county superintendents of the future should be among the most competent and capable educational leaders in this state. They should be selected on the basis of professional competence rather than political availability. They will furnish service of a quality and in a manner desired and accepted by all districts at all levels. This will surely come to pass in spite of the obstacle posed by the lack of long-range planning. Within a cooperatively developed organization this desirable situation would be achieved in a relatively shorter period of time, and with wider acceptance throughout the State of California.

Microfilm copy of complete manuscript of 234 pages, \$2.93. Enlargements 6" x 8", 10¢ per page. Library of Congress card number MicA54-406.

### THE ROLE OF THE HIGH SCHOOL PRINCIPAL IN THE ADMINISTRATION OF TEACHER EDUCATION PROGRAMS

(Publication No. 6876)

Robert Bankert Kennedy, Ed.D.  
Stanford University, 1953

The purpose of this study is to identify and analyze the role of the public senior high school principal in the administration of teacher education. To achieve this purpose it was necessary to make a careful study of the organizational, administrative and supervisory activities of the principal in the following areas:



1. How does the principal interpret school law as it relates to teacher education?
2. What are the relationships of the principal to the agencies that are concerned with teacher education?
3. What are the activities of the principal in making the resident teacher and student teacher effective participants in teacher education?
4. What is the principals' experience as he administers the program in believing that his attitudes toward teacher education might be changed?

This investigation was limited to the judgments of fifteen high school principals as to their administrative practices in teacher education; to the judgments of directors of teacher education at Stanford and San Jose State College; to the judgments of state, county and city superintendents of schools; and to the judgments of 130 high school principals throughout the state, who accepted student teachers, as to whether they included the administration of teacher education among their major duties.

Structured and free response questionnaires were given to the fifteen participating principals. The latter were tape recorded. The remaining participants were given free response questionnaires.

A summary of the findings of this study follows:

#### Administration and Supervision

1. Principals do not consider administration of teacher education as one of their major duties.
2. Principals receive little or no assistance from the State Department of Education, and city and county superintendents of schools in administering teacher education.
3. Principals spend more time administering than supervising the program.
4. The principals' greatest administrative problem is lack of time to administer the program.
5. The principals' major administrative and supervisory tasks are (a) coordinating the program, (b) selecting resident teachers, (c) assigning student teachers, (d) holding orientation meetings and conferences, (e) confirming certification of student teachers, (f) handling extra-curricular activities, (g) assisting student teachers to participate in community activities.
6. Principals leave classroom supervision to resident teachers and teacher education supervisors.
7. There exists a lack of mutual understanding between principals and teacher education institutions on supervision policies.

#### Principals' Self-Evaluation of Attitudes

1. The principals' own experience as student teachers has the most powerful effect on their attitudes.
2. Boards of education, superintendents, college courses and parental attitudes have little influence on principals.
3. The most favorable attitudes came through satisfactory administrative experience.
4. Unfavorable attitudes develop because of (a) too frequent turnover of contact personnel, (b) difficult problems that arise, (c) unsettled status of

resident teacher compensation, (d) lack of time.

#### Recommendations

The data presented would seem to justify the following recommendations to assist in making the principal more effective in administering teacher education:

1. Teacher education should receive more emphasis in college and university courses in administration.
2. Greater use should be made of the "solution of problems" as a technique for improvement.
3. There should be an improvement of personnel relations.
4. Principals should be used as consultants on all administrative levels and in college classes in administration.
5. Equitable policy for compensating resident teachers should be established.
6. Mutually satisfactory supervisory policy should be developed.
7. Evaluation of organization, administration and supervision in the philosophy and time plan of principals should be made.
8. Staff meetings should be used to discuss mutual problems.
9. The turnover among teacher education institution coordinators should be kept to a minimum.
10. There should be constant evaluation of schools' internal administrative organization.
11. Studies of successful administration in teacher education should be made.
12. The possibilities for graduate students to participate in field work in high school administration should be extended.

Microfilm copy of complete manuscript of 409 pages, \$5.11. Enlargements 6" x 8", 10¢ per page. Library of Congress card number MicA54-407.

#### **SOME CHARACTERISTICS OF DEVELOPMENTAL CHANGES IN REORGANIZED SCHOOL DISTRICTS IN ILLINOIS**

(Publication No. 6965)

Joseph Andrew Mason, Ed. D.  
University of Illinois, 1953

Reorganization of the school district structure in Illinois was designed to bring about improvements in the educational system.

Within recent years an increasing number of questions have been raised as to whether the purposes underlying reorganization are being reasonably well accomplished. This study attempts to throw some light on this question by comparing certain conditions in ten representative school districts four years after reorganization with the conditions that existed prior to reorganization. The aspects of the school system which were examined for change over the four-year period were determined by a synthesis of the reports of the County Survey Committees in

the various counties of the state. The County Survey Reports were used as a basis for the study because they furnished an expression by lay people, on a state wide basis, of the aspects of the school program where they thought changes should be made.

In selecting the districts for study a random sampling technique was employed to select ten counties from among the counties of the state which had reorganized at least eighty per cent of their territory. A further random sampling was then employed to select one district from each of the ten counties to be examined. This study was limited to those reorganized school districts in Illinois with a student population between 500 and 2,500.

The study found that many adaptations were made in the school program that might reasonably be attributed to reorganization of the local districts. Changes were particularly noted in the following areas:

Status of the teacher. The improvement in training, tenure, and salary of the teachers in the reorganized schools were closely associated with the establishment of uniform policies on the part of the board of education giving equal recognition to elementary and secondary teachers.

Ability to finance education. The reorganized school districts had a broader tax base on which to finance the educational program. Along with the provision of more adequate funds was found the establishment of more acceptable business procedures.

The curriculum. The curriculum in all school districts studied was modified by some changes during the period of reorganization with trends being discernible in the establishment of more opportunities in the fine arts; the development of continuous programs which extend from grades seven through twelve, particularly in the areas of home economics and industrial arts; and increased attention being focused on the needs of the individual student.

The establishment of additional services. The reorganized districts showed a significant increase in the establishment of such services as transportation, health services, adult education classes, and hot lunch programs.

Leadership. The reorganized district provided a legal structure in which it was possible for a designated leader, the superintendent, to exercise what appears to be a more effective leadership function. All districts studied showed the effects of this leadership in the development of better coordination and integration within the school system. There was a wide variation between districts in the superintendent's awareness of the possibilities for educational improvement in the reorganized school district and in his expressed purposes for the educational program.

The variation in degree of change which occurred in the districts studied indicated that some causal relationships existed between certain environmental factors and the degree of educational change. Two of these relationships which appeared to be most significant were the quality of leadership and the degree to which internal reorganization took place. Reorganization of administrative districts provided the

means for the development of a better educational program, but local leadership and favorable conditions of internal consolidation appeared to be key factors in accomplishing the ends sought by reorganization.

Microfilm copy of complete manuscript of 176 pages, \$2.20. Enlargements 6" x 8", 10¢ per page. Library of Congress card number MicA54-408.

**THE PERSONNEL ADMINISTRATOR IN CITY SCHOOL SYSTEMS: A STUDY OF THE DUTIES AND FUNCTIONS OF PERSONNEL OFFICERS AND OF ADMINISTRATIVE ORGANIZATIONAL PLANS FOR PERSONNEL MANAGEMENT IN PUBLIC SCHOOL SYSTEMS IN SELECTED CITIES AS COMPARED TO PERSONNEL PRACTICES IN OTHER FIELDS**

(Publication No. 7134)

Francis J. McCarthy, Ed. D.  
New York University, 1953

The problem considered in this study, briefly stated, is "What plans for personnel administration are in effect within large city school systems?" and "What are the functions, duties, and responsibilities of school system executives who are personnel administrators?"

Since evidence indicates that personnel management has made rapid development in business, industry, and the public service, particularly since World War I, an examination of personnel administration in these fields becomes a part of the problem in order that necessary comparison with school personnel administration may be made.

Through the media of a literature survey, graduate work, interviews with selected personnel executives, and reference to a panel of experts, an investigation of personnel management in business, industry, and the public service was made. It revealed certain common features. First, the personnel function is centralized and headed by a specialist. Second, the personnel department is a staff division of top management. Third, the functions usually administered by the personnel executive are grouped under six (6) main headings: (1) Employment; (2) Training; (3) Wage and Salary Administration; (4) Relations; (5) Services; (6) Research.

Each of these is complex and involves many other functions, as, for example, recruitment, selection, induction, transfer, promotion, records, and separation from service, all of which are part of Employment. So too does each of the other main functions include many subordinate functions.

Investigation of business, industrial, and public service personnel practice also revealed the existence of a body of fundamental principles which meet with general acceptance and these are stated in the study.

Turning to large city public school systems, the study presents data on the present status of personnel



administration, data gathered by means of interviews, questionnaires, and professional literature. Administrators in sixty-seven (67) cities of 100,000-500,000 population contributed data.

In general, there are found three (3) organizational plans for personnel administration in large city school systems. They are:

1. No personnel department, superintendent acting as personnel administrator.
2. Personnel function is centralized to the extent that an administrator is responsible for it in addition to other duties, for example, Director of Instruction and Personnel.
3. Separate personnel department headed by an executive responsible only for personnel administration.

Twenty-nine (29) school systems (43 per cent) report the existence of a separate department and in fourteen (14) other cities (21 per cent) organization as described in No. 2 above is in effect. No personnel department (No. 1 above) is found in the remaining twenty-four (24) cities (36 per cent).

Regardless of the plan followed, there is agreement among all who report themselves as personnel administrators as to the number and variety of their duties and responsibilities. In general terms, these fall into the same major divisions noted in fields outside education. There is naturally varying emphasis on the individual functions since the busy superintendent cannot give the time to personnel work as can he who is primarily a personnel manager.

From the forty-three (43) cities which are distinguished by centralization of the personnel function data on practices was sought through a second questionnaire to which 80 per cent responded. The answers received indicate that many of the practices found in other fields are used by school personnel officers, adapted, of course, to their situation. However, there are some practices and techniques which have been developed in the other fields and these may possibly be further developed to meet better the needs of school officials.

Included in this latter category are such practices as job analysis and job description as aids in selection and placement; training for higher posts; classification as a tool in salary administration; grievance plans, and personnel research.

The study concludes with recommendations in regard to adapting some of the techniques, such as those mentioned above, which have proven to be valuable in other fields, and with recommendations in regard to weighing current practices in terms of their effectiveness in comparison with the same practice as it is done in business, industry, or the public service.

All recommendations in summary point to one statement which urges that a personnel department be established in cities where such a plan is not followed, that the personnel function be separated from others, and that study of personnel practices in business, industry, the public service, and education be constant under the direction of a specialist.

Microfilm copy of complete manuscript of 241 pages, \$3.01. Enlargements 6" x 8", 10¢ per page. Library of Congress card number MicA54-409.

## CHARACTERISTICS OF BOYS IN A METROPOLITAN CONTINUATION HIGH SCHOOL

(Publication No. 6880)

James Charles Morena, Ed. D.  
Stanford University, 1953

The purposes of the study were to determine the characteristics of continuation school students, to relate these characteristics to both the secondary school and the continuation high school, and to draw from this analysis suggestions for a continuation education program for boys. The study attempts to discover answers to the following questions:

What are the characteristics of continuation school boys?

What are the characteristics of regular full time school boys?

How do they differ in clearly established, significant ways?

How do these differences become reflected in the school program for continuation boys?

The investigation was confined to the study of 123 boys enrolled in the San Francisco Continuation School during the year 1950-1951, and to 113 boys enrolled in a large metropolitan high school in that city.

The continuation boys were selected by drawing every third card from a general alphabetical file of all students enrolled at the continuation school. The full time regular high school boys were selected by taking all boys enrolled in a required course in one high school. Each of the 123 continuation students was interviewed by one of two interviewers for a minimum of two hours, and the data were recorded on the Interview Information Guide which was developed specifically for this study. Data for the 113 regular high school boys were gathered by a questionnaire based on the Interview Information Guide. After the interviews, the school records were investigated.

### FINDINGS

#### Differences Between Continuation and Full Time High School Boys.

Single homes, flats, and apartments were the most frequent types of living quarters used. About 12% of the continuation boys lived in trailers, hotels, or housing projects. (See Table II.)

The types of work wanted by the continuation boys were in the mechanical fields. (See Table III.)

Both groups had a variety of hobbies and interests. The continuation boys were interested and engaged largely in mechanical types of activities. Full time boys indicated major interests in sports, reading, and music. (See Table IV.)

#### Reactions to the High School Program.

1. 93 per cent of the full time and 59 per cent of the continuation group indicated that they took the courses they wanted while attending high school.

2. The Continuation boys felt that they had received little help in the following areas: personal and community health, worthy use of leisure, using

good English, how to read and write well, preparing for a job, how to get and keep a job, getting along with others, and civic participation. The full time boys indicated that they had been helped a great deal in most of these areas.

#### Other Data about Continuation Boys.

1. Over one-half were retarded one or more grades.
2. The greatest number of drop outs occurred in the tenth grade.
3. Over one-half felt a need for further education in English, mathematics and industrial arts.
4. Lack of adjustment to the high school program was one of the major reasons for leaving full time school.
5. An opportunity to work while attending school would have encouraged many to remain in full time school.

#### Suggestions

1. Action focused on prevention of maladjustment in the full time school.
2. The continuation program must be particularly sensitive to individual differences in ability.
3. The continuation education program should include:
  - a. Medical, dental and nursing services normally given to full time school students.
  - b. Strong reading programs, adjustment education for slow learners, and remedial classes and activities which will interest those students of low ability as well as challenge those with special interests and abilities.
  - c. Adequate job training facilities, work experience programs, a variety of business, household economics, shop, art and crafts, personal and community health, and short unit courses where progress is based on achievement.
  - d. Teacher time and facilities for social, recreational and club activities as normally given to full time school students.

TABLE I  
Personal Differences

Characteristic	Continuation 123 boys	Full Time 113 boys	C.R.	Chances in 100 that the Difference is Significant
Foreign Born	4.90%	16.80%	2.98	98
Normal Health	89.50%	96.50%	2.19	98
Intelligence Test Mean Score	93.05	102.06	3.33	99
Delinquency Rate	33.00%	3.50%	6.44	99
Contribute to family	82.00%	90.00%	1.78	96

TABLE II  
Differences - Family Background

Parents - Foreign Born	22.00%	40.75%	3.18	99
Live with both Parents	49.50%	77.00%	4.58	99
Broken Homes	47.00%	23.00%	4.00	99

TABLE III  
Employment

Work Experience	93.00%	79.00%	3.18	99
Desire to Work and Attend School	94.00%	86.00%	2.00	98

TABLE IV  
Differences - Participation in Activities

Community Activities	34.1%	37.20%	.50	69
High School Activities	24.3%	77.00%	9.58	99



e. An extensive guidance program to include orientation, vocational, educational and personal problems counseling, testing, and Placement and coordination services.

4. The curriculum should be flexible enough to allow for tryouts in courses, for shifting from one course to another, and to allow for much experimentation with teaching methods and class organization.

Microfilm copy of complete manuscript of 136 pages, \$1.70. Enlargements 6" x 8", 10¢ per page. Library of Congress card number MicA54-410.

# POLICIES AND PRACTICES OF ILLINOIS SCHOOL BOARDS IN RESPECT TO THE USE OF PUBLIC SCHOOL BUILDINGS FOR NON-SCHOOL PURPOSES

(Publication No. 7074)

Robert Lyle Reinsch, Ed. D.  
Northwestern University, 1953

Boards of education, acting in their capacity as policy-making bodies for their respective school districts, are often called upon to make decisions relating to noneducational as well as educational functions of their school systems. This study was centered about the rules and regulations adopted by Illinois School boards to govern the non-school use of public school buildings.

## The Problem

Illinois statutes give school boards wide discretionary powers relative to granting use of school buildings for community purposes. Consolidation of school districts, changes in the conception of the functions of the school, and changes in community structure have led to increased demands for auxiliary use of school facilities.

One of the purposes of this study was to discover what rules and regulations had been adopted by boards of education relative to non-school use of the public school buildings and to evaluate them in terms of Illinois law and accepted standards of good administrative practice.

Another purpose was to bring together, in one volume, information on legal matters, administrative devices, and desirable practices for the convenience of those board members and school administrators who wish to evaluate their present rules and regulations or to adopt new policies on the community use of school facilities.

## Design and Procedure

A questionnaire, developed through interviews and "trial runs" was used to collect data from the cooperating school districts. The research instrument was distributed throughout the state, attention being given to size, type, and location of district. Findings on district practices were tabulated from the usable returns of 428 school officials. The resulting data were presented in both tabular and summary form. The majority of items dealt with the

problems of who were allowed use of the buildings, times use was permitted, charges made, and provisions for the supervision and control of the groups using the buildings.

Pertinent legal material was obtained from a search of federal and state constitutions, state statutes, court decisions, and legal opinions. This material was presented in some detail in the appendix of the study.

## Major Findings

Five chapters were devoted to presentation of the findings as represented by the responses to the various items of the research instrument. In the final chapter were presented 48 statements on legal and questionnaire findings. Typical examples were as follows:

1. Fraternal orders, political groups, and commercial organizations may be permitted use of the buildings.

2. School boards may not purchase liability insurance with public funds.

3. Boards of education may grant free use of the buildings or levy a charge. The district, however, may make no profit on rentals and charges for use for religious purposes must equal the cost of the activity to the district.

4. School buildings in Illinois are used to about 20 per cent of their potential capacity for non-school purposes.

5. Sixty-two per cent of the school boards in Illinois have written policy on auxiliary use of the schools.

6. Of all the control provisions, the one found most difficult to enforce was the ban on smoking.

7. Illegal and questionable practices were reported by more than one-third of the districts.

## Conclusions

A list was made of 22 conclusions relative to policies, law, finance, and extent of building use. Typical of these were:

1. All but a few of the school administrators in those districts which had no written policies on wider use of the schools were desirous of having such policies formulated and adopted.

2. Some of the school administrators, and many of the board members, in Illinois apparently were not familiar with provisions of the School Code of Illinois as they pertain to the non-school use of public school buildings.

3. There was need for the establishment of better accounting practices in those districts which: (1) included the costs of non-school activities in their per-pupil calculations, (2) deposited rental receipts in unauthorized funds, and (3) allowed groups to pay the janitors directly.

4. The schools would apparently be used to a greater extent by youth groups if increased supervision were provided by the adult members of the community.

## Recommendations

Inasmuch as this study touched upon many facets

of school administration it was natural that the recommendations fell into several categories. The first group of suggestions were classed as general recommendations, 12 in number. The second group concerned themselves with four recommended changes in school law, and the third, with rules and regulations which were presented for consideration by school boards. The fourth group of recommendations included an enumeration of the items found desirable to be used in building-use forms.

Microfilm copy of complete manuscript of 378 pages, \$4.73. Enlargements 6" x 8", 10¢ per page. Library of Congress card number MicA54-411.

### THE OPERATIONALLY DEFINED ROLE OF TRUSTEES IN ONE-TEACHER SCHOOLS

(Publication No. 6885)

Harold Lawson Smith, Ed. D.  
Stanford University, 1953

The purpose of this study was to describe the legally defined role of trustees in one-teacher school districts in California, to describe the operationally defined role of the trustees in the one-teacher school districts in three California counties, to discover the discrepancies between these roles, and to help clarify the problem of the responsibility for administration in one-teacher schools.

Data were collected by interviews with all of the trustees in the one-teacher school districts in three California counties and by a study of the Education Code of the State of California. A "Guide to Interviews" was used that encouraged free expression on the part of trustees concerning their actual duties, required answers to twenty-three questions based on mandatory regulations for school trustees in one-teacher districts and furnished responses to five problem situations that covered different areas of administration.

#### Findings

1. The legally defined role of trustees in one-teacher schools can only be defined by the more than 200 sections of the Education Code listed in the study.
2. The operationally defined role of trustees in one-teacher schools included in the study consists largely of attending meetings, repairing equipment or school buildings, aiding the teacher, contacting parents, employing teachers and working on the budget with the county superintendent.
3. The discrepancies between the legally defined role and the operationally defined role of the trustees are: No regular meeting time is set in 72.72 per cent of the districts; records of the meetings are not kept in 56.52 per cent of the districts; accurate records of receipts and expenditures are not kept in 82.60 per cent of the districts; none of the districts post a complete copy of all receipts and expenditures on the first Monday of October, January, March and June; none of the districts provide for the testing of sight

and hearing and none of the districts provide for the bonding of each employee who handles district funds.

#### Conclusions

1. The majority of the trustees interviewed are satisfied with the job they are doing and feel confident of their ability to solve school problems.
2. The experience trustees have had as administrators is an impediment in the progress of district reorganization.
3. Trustees are actively participating in school affairs as administrators. The theory that trustees perform only policy-making duties is proved meaningless in the case of one-teacher school district trustees.

#### Recommendations

The following pattern for the administration of one-teacher school districts in California is recommended:

1. District reorganization should be continued wherever possible to provide larger administrative areas.
2. Where reorganization is delayed, the county superintendent should be encouraged to provide the leadership, special services and the management of the business services for small school districts.
3. A committee of trustees of one-teacher schools and county superintendents should be appointed by the State Superintendent of Public Instruction to study the provisions of the Education Code as they affect small school districts and to recommend necessary changes.
4. Trustees of one-teacher school districts should be provided with informative, periodic bulletins written in laymen's language that explain educational affairs.

Microfilm copy of complete manuscript of 234 pages, \$2.93. Enlargements 6" x 8", 10¢ per page. Library of Congress card number MicA54-412.

### A CASE STUDY IN PUBLIC SCHOOL LEADERSHIP: HEROLD C. HUNT

(Publication No. 6886)

William Max Staerkel, Ed. D.  
Stanford University, 1953

The purpose in making this study was to trace the professional career of Herold C. Hunt from its beginning in Hastings, Michigan through his stay as superintendent of schools in Kansas City, Missouri. Specifically, the study attempts to show how Hunt attacked the major educational problems which confronted him as superintendent of schools in the communities of St. Johns, Michigan; Kalamazoo, Michigan; New Rochelle, New York; and Kansas City, Missouri. No attempt was made to review Dr. Hunt's superintendency of the Chicago, Illinois schools as he had not yet concluded his stay in that city as the study was being made.



The fact that Dr. Hunt's career began in a small town with a population of only four thousand, and ultimately led to the superintendency of the nation's second largest city provides a unique opportunity to study the educational achievements, and the techniques and methods employed by one man in his rise to prominence.

The writer spent approximately eight weeks in visiting the communities of Hastings, Michigan; St. Johns, Michigan; Kalamazoo, Michigan; New Rochelle, New York; and Kansas City, Missouri. Data was secured from three principal sources - minutes of board of education meetings, interviews, and newspaper stories. Some time was also spent in Chicago where the writer had access to Dr. Hunt's personal files.

It was found that Herold Hunt initiated a vigorous and constructive program of education in each of the communities in which he served. Interestingly enough this program was somewhat stereotyped in its broad outlines in New Rochelle and Kansas City when compared to the program developed earlier in Kalamazoo. Dr. Hunt proved to be fearless, aggressive, and confident in his own ability to make important decisions. He maintained a highly professional attitude toward teachers, but upon occasion evidenced an almost unconcern toward teacher attitude if he felt that the circumstances warranted it.

Dr. Hunt seemed to possess an almost intuitive sense of the tenable position to be taken in stress situations. He was able to make snap-judgment decisions and persist in his stand until the matter was settled. In nearly every instance the ultimate decision followed his earlier recommendations.

The study revealed a clear pattern of public operation on the part of Dr. Hunt in the prosecution of the educational program. This policy emphasized close and friendly relations with newspapers, businessmen, and student leaders. His relations with all three were excellent in each of the communities studied.

A major factor in the steady advancement of Herold Hunt to positions of greater responsibility was his effectiveness as a public speaker. Also important was his ability to remember names and faces - an ability which impressed his associates wherever he served.

The career of Dr. Hunt would seem to indicate that there is some advantage in making immediate and often seemingly drastic changes upon entering a new community. Hunt did this with outstanding success in regard to certain educational problems which had successfully resisted earlier attempts at solution.

Dr. Hunt held the belief that the modern school superintendent must belong to a great many organizations in order to know the community adequately and serve the schools to the best of his ability. The facts seem to show that this policy contributes to a greater prestige for the superintendent of schools and his office, and a friendly and congenial attitude toward the school system on the part of different groups of people.

The administration of Dr. Hunt in Kansas City, Missouri revealed among other things, that it is

possible for a board of education to render itself virtually useless as a policy making body through circumstances beyond the control of the superintendent.

Microfilm copy of complete manuscript of 204 pages, \$2.55. Enlargements 6" x 8", 10¢ per page. Library of Congress card number MicA54-413.

## EDUCATION, HISTORY

### A HUNDRED YEARS OF CIVIC EDUCATION IN WASHINGTON, 1853-1953

(Publication No. 6897)

Emlyn David Jones, Ph. D.  
Stanford University, 1953

The legislature, the state board of education, and the local school districts have all regarded civic education as an important aspect of the school program in the State of Washington. In this historical survey, the roles of each of these agencies in developing the State's program of civic education in the public schools have been traced from the establishment of an organized system of public education shortly after Washington became a territory in 1853 to the present. Information regarding these roles was obtained from public documents; reports of the state, county, and local superintendents; courses of study published by the state board of education, the county offices, and the local school systems; from school surveys; historical accounts; and also from personal interviews, letters, monographs, newspapers, and professional journals.

Civic education is defined in the study as the school's effort to increase the competence of young people for participation in a democratic society under organized representative government. The study is concerned with the development of all courses commonly listed under the heading of social studies in the curriculum of the public schools, namely: history, civics, geography, economics, sociology, problems of democracy courses, and all combinations of these subjects.

The legislature has provided the basic foundation for civic education in fostering the establishment and growth of a system of free public schools and in requiring parents to send their children to be educated either in the public schools or in private schools of the parents' own choosing. In addition, the legislature has specifically required the teaching of the history and government of the United States and the State of Washington, and has required teachers to instruct their pupils in the principles of free government and in the rights, duties, and dignity of American citizenship.

The state board of education and the state superintendent of public instruction have provided leadership through their published courses of study and

have influenced the legislature in raising the standards for the training of teachers. Under the leadership of the state board, the course of study in civic education has grown from a single requirement consisting of a few questions in history and geography to be asked of prospective teachers, to a recommended sequence in social studies extending from the kindergarten through the high school.

The teaching profession itself has been one of the most potent factors in the development of the State of Washington's program of civic education. As a result of their efforts, the school program has generally been in advance of legislation and often of the rulings and recommendations of the state board. The teachers have on several occasions instigated legislation bearing upon the civic education program. In 1877, the teachers were responsible for the adoption of the original law requiring the teaching of American history in the schools of Washington.

A survey made in 1952 by the state superintendent of public instruction showed that the schools were exceeding by a considerable margin the legislative requirements in the teaching of history, government, and citizenship.

The dissertation describes some of the way in which the schools are improving civic education by using classroom, school and community life. Suggestions for practices to further improve civic education are made and areas for further research are indicated.

Microfilm copy of complete manuscript of 243 pages, \$3.04. Enlargements 6" x 8", 10¢ per page. Library of Congress card number MicA54-414.

## EDUCATION, PHYSICAL

### THE FORMULATION AND VALIDATION OF OPERATIONAL PRINCIPLES FOR A NATIONAL PROGRAM OF PHYSICAL EDUCATION FOR IRAN

(Publication No. 7125)

Hossein Banai, Ed. D.  
New York University, 1953

The purpose of this study was to formulate and validate a set of principles which can be used later as a guide for preparing and conducting a physical education program for Iranian schools.

This was not the first study of its kind for Iran but the only study which has been done for the field of physical education. The modern physical education program is very young and is passing the time with uncertainties and any study of this type should be helpful and welcomed by the ministry of Education.

The available literature concerning the geography, people, public health, economics, political, religious, cultural, social and educational aspects of Iran generally, and physical education specifically, were ob-

tained from various branches of the Iranian government, National Society of Physical Education, United Nations and public libraries.

In order to formulate the applicable principles for physical education the following steps were taken:

1. Establishment of physical education principles in the nine recognized areas according to contemporary American literature.

2. Selection of the factors found relevant to the concerned area from literature discussing Iran.

3. Application or modification of the American principles for Iran according to the factors found.

Each section of the nine areas was followed with recommendations for all applicable or desirable principles.

The highlights of the formulated principles are shown in the nine following areas:

1. Interpretation. Philosophy of physical education, as a phase of education, should be based on the philosophy of contemporary life of people.

2. Objectives of Physical Education. Physical education objectives should be based on guidance of students so that they will be helped to spend their leisure happily, to develop the organic systems of their bodies, and to develop good judgment, good coordination, sound emotion, and good traits of character.

3. Community Organizations. Because of centralization of the governmental functions in Iran, community organizations do not exercise any influence upon the physical education program. Therefore no principles are formulated for this area.

4. People . . . Status, Educability, and Capacity. The program of measurement and evaluation should be planned and utilized in order to yield optimum results for physical education. This program should include the measurement and evaluation of the physical, social, emotional, and mental abilities of the students.

5. Programs. The physical education program should be educational and so planned, facilitated and guided as to provide experiences that will enrich the lives of the participants.

6. Leadership. Opportunities for the cultivation of leadership within physical education activities should be prepared by the teachers. Acceptable leadership should be thought of as more than a mastery of techniques and proficiency of skills.

7. Administration. The administration should prepare the facilities and develop such physical education program as to meet the needs of every individual. It should assign sufficient and well qualified personnel in order to obtain quantity and quality in the program.

8. History and Trends. Modern physical education is a young movement in Iran. Its history is too contemporary to discuss and its trends are not yet clear. Therefore no principles were established in this area.

9. Profession. Professional preparation should be such as to render the professional worker capable of optimum performance on the job in the various levels and types of responsibilities.

It was concluded that with the exception of the



areas on Community Organizations and History and Trends, most American principles of physical education were either applicable or desirable for Iran.

As for the recommendations, the emphasis is based essentially upon the following:

1. More facilities and equipment.
2. More and better qualified teachers.
3. More hours per week.
4. A better educational program.

Microfilm copy of complete manuscript of 805 pages, \$10.06. Enlargements 6" x 8", 10¢ per page. Library of Congress card number MicA54-415.

#### ATHLETIC CONTROL IN MEMBER INSTITUTIONS OF THE PACIFIC COAST INTERCOLLEGIATE ATHLETIC CONFERENCE

(Publication No. 6882)

Robert Arthur Mott, Ed. D.  
Stanford University, 1953

#### I. Problem

This study was an attempt to ascertain the definite location of authority and responsibility to determine the policy and to administer the intercollegiate athletic program in member institutions of the Pacific Coast Intercollegiate Athletic Conference.

#### II. Procedure

The principle sources of data for the study were the published materials of the National Collegiate Athletic Association, the Pacific Coast Intercollegiate Athletic Conference, the American Council on Education, the North Central Association and authorities in the field of intercollegiate athletics. These data were supplemented by interviews with key personnel in member institutions of the Pacific Coast Intercollegiate Athletic Conference.

With the approval of Commissioner Victor Schmidt, arrangements were made for interviews at each of the member institutions of the Pacific Coast Intercollegiate Athletic Conference. An interview guide was prepared to assist in the interview and to guarantee a reasonable degree of conformity in the questions asked.

Criteria of the desirable principles of intercollegiate athletic control were developed from the various conference's constitutions and by-laws. Recommendations and documentary material of professional individuals and groups were also used in the development of the principles of control.

The data secured in the interviews were analyzed and evaluated against the defined criteria.

#### III. Conclusions and Recommendations

Conclusions. Out of this study the following conclusions have emerged.

In establishing the criteria it was found that the literature revealed a high degree of uniformity among athletic associations, educational associations

and authorities with regard to the desirable principles of the control of intercollegiate athletics.

Administrative heads of member institutions realized the importance of providing sound and thoughtful leadership to the control of intercollegiate athletics.

The presidents of member institutions of the Pacific Coast Intercollegiate Athletic Conference reported they are making vigorous efforts to control and conduct their intercollegiate athletic program in complete accord with the rules and regulations of their conference.

All personnel interviewed who were concerned with the control of athletics in the Pacific Coast Intercollegiate Athletic Conference are very anxious to eliminate any malpractice in their own institution and in the conference.

Recommendations. In comparing current practices with the criteria the following recommendations applicable to the control of intercollegiate athletics are presented.

The administrative heads of the member institutions of the Pacific Coast Intercollegiate Athletic Conference should continue to be concerned actively with the various problems of intercollegiate athletics. They should continue to give active, diligent leadership to the program on the basis of the desirable principles listed, not only in their own institution but also on a conference and national level.

The conference members operating their intercollegiate sports on a major-minor basis should abolish this practice and place all recognized sports on an equal basis, financed and conducted in a similar manner.

Member institutions should continue the reported practice of not permitting alumni and outside groups to officially control the intercollegiate athletic program.

Members of the athletic staff should be given the same status as other faculty members.

Conference institutions should continually examine their intercollegiate athletic program in light of the interests of their undergraduate student participation.

Athletic departments should be financed in the same manner as any other department of the college or university. The income from the athletic program should go into the general fund of the institution.

Institutions in which the athletic department is a part of the associated student's program should examine their organizational structure with a view of bringing about a closer relationship between the administration and the intercollegiate athletic department.

Microfilm copy of complete manuscript of 134 pages, \$1.68. Enlargements 6" x 8", 10¢ per page. Library of Congress card number MicA54-416.

**A SOCIOMETRIC ANALYSIS OF GROUP  
STRUCTURE AND THE EFFECT OF  
FOOTBALL ACTIVITIES UPON THE PATTERNS  
OF INTER-PERSONAL RELATIONSHIPS**

(Publication No. 7139)

Joseph Ondrus, Ed. D.  
New York University, 1953

The purpose of this study is to analyze the group structure and trace the patterns of inter-personal relationships of the members of a football squad to determine what bearing these may have upon group cohesiveness.

The general nature of the study is revealed in the statement of the problem. While this reflects the central theme throughout the study, there are a number of specific questions for which answers are sought. The questions are listed below to help clarify the exact nature of the study.

1. What is the group structure of inter-personal relationships of a group of participants in football?
2. What is the relationship of environmental factors, individual and group characteristics, and abilities of participants in football?
3. What is the relationship among environmental factors, individual and group characteristics, and abilities in football and the individual's position in the group structure in football?
4. What changes have occurred in group structure and patterns of inter-personal relationships as shown progressively in terms of the sociograms and their relationships over a defined period of time?

The related literature in this study was organized to include the foundations of sociometry, the sociometric test, the sociogram, comparison of the game of football to elements of a social system, measurement of social status, effect of personality factors upon social status, social relationships, measurement of group integration, matrix approach to the measurement of sociometric data, the sociogram versus the sociomatrix, and group cohesiveness.

Thirty-eight varsity football players in the eleventh and twelfth grades at the J. Sterling Morton High School, Cicero, Illinois comprised the population for this study during the 1951 football season.

Tests, instruments, and techniques used for gathering and collecting data are as follows:

A skills rating scale was used to rate the players as to skill in performing the fundamentals of football.

The sociometric test was administered to the squad five times at two week intervals for a period of ten weeks.

The information from the test was placed on tabulation and tally forms and the sociograms were constructed from this data. Information from the sociograms was identified for further investigation by use of the sociometric analysis schedule.

The sociomatrix was also constructed from the tabulation forms.

The California Test of Personality, secondary series, was administered to the players to locate more restricted areas of personality difficulties.

The Goldberg Football Knowledge Test was ad-

ministered to the players and each player was classified as to body build by the Cozens' Height-Weight Chart.

IQ, EQ, age, and environmental factors were obtained from cumulative records. A daily log was kept to observe actions of the football group and written interviews were administered to obtain players' reactions as to how they felt about themselves and others. Finally a social contact range test was administered to ascertain range of social contact.

Conclusions indicated that interaction cannot be static and shifts upward and downward among players in social status are bound to occur but the total group structure as is evident in the sociograms is not significantly different. The majority of the over chosen seem to have one thing in common - an abundance of skills for playing the game of football.

Statistical significance was attached to: father played, both contact scores, on a three and six percent level; above average occupation as "percent of spoken to" on a five percent level; medium weight, as "percent of spoken to" on a six percent level; one season varsity, as "percent of spoken to" on a less than one percent level. The positive correlation of +.628 between social status and football skill showed substantial relationship.

Microfilm copy of complete manuscript of 235 pages, \$2.94. Enlargements 6" x 8", 10¢ per page. Library of Congress card number MicA54-417.

**AN EVALUATION OF THE PHYSICAL  
EDUCATION SERVICE PROGRAMS  
IN THE LIBERAL ARTS AND TEACHERS  
COLLEGES OF NEW YORK STATE**

(Publication No. 7107)

Byron Milo Phillips, Ph. D.  
New York University, 1953

**Nature of the Problem**

The purpose of this study was to construct an instrument which would furnish significant data for the evaluation of the required or service programs of physical education for men in the universities, liberal arts and teachers colleges of New York State. Certain evaluative data were derived from a study of the needs of college students and broad administrative principles of physical education. Dual standards (optimal and essential) were developed and validated which served as bases for evaluating the component parts of the overall physical education program.

**Summary of the Procedure**

The determination of needs of college students which should be met, wholly or in part, by the physical education service program involved the collection of data from statements of authorities and a survey of authoritative literature. The five major needs were found to be: organic development, neuromuscular skills, knowledge, social adjustment and leadership.

Basic principles, which should govern the



operation of the service program of physical education, were gleaned from a survey of the literature relating to broad administrative principles.

Standards were developed, established and validated commensurate with the needs and basic administrative principles by means of authoritative literature and a panel of twelve recognized authorities in the field of physical education.

The present status of the service programs of physical education was determined by a questionnaire which was sent to the forty-six institutions comprising the study. There was a 100 per cent return of the questionnaires. Arithmetic mean scores were obtained for each of the eleven major headings. On the bases of these mean scores, the institutions were ranked and a representative sampling of fourteen institutions was obtained for the purpose of further study.

#### The Evaluation

The fourteen institutions comprising the representative sampling were visited personally by the investigator and additional data collected. Analyses of their overall physical education programs were made and compared to a rating scale. This rating scale was developed on the bases of the optimal and essential standards. The optimal standard received a rating of eight points, and the essential standard four points, variations above or below these two constants received corresponding point values from ten to zero.

Reliability of the data contained in the questionnaires was determined by computing and comparing correlations between questionnaire data and visitation data. These correlations ranged from 1.000 to .725. Stability of the correlations were determined by testing them in accordance with the Null Hypothesis. All major areas under consideration exceeded the .01 level of significance.

As an additional part of the study, leadership and social adjustment of students participating in the service program was measured by a sociometric test.

#### Summary of Findings

1. The evaluation of the required or service programs of physical education in New York State showed wide variations in programs from excellent to poor.

2. A majority of institutions met or exceeded the minimal essential standards in the areas of administration and supervision, attendance, staffs, programs, facilities and equipment.

3. A majority of institutions did not meet the minimal essential standards in the areas of institutional requirements, course requirements and classification of students.

4. Leaders in the physical education program may be selected adequately by the students in the class, by the instructor, or by a combination of these two methods.

5. The questionnaire data received from the institutions were highly reliable and stable.

6. The percentage of institutions of higher learn-

ing in New York State requiring physical education for graduation was much lower than was found to exist in similar institutions throughout the United States.

7. The quality and type of the college physical education program was reflected in the lack of adequate programs designed to meet the needs and interests of students in the elementary and secondary schools of New York State.

Microfilm copy of complete manuscript of 478 pages, \$5.98. Enlargements 6" x 8", 10¢ per page. Library of Congress card number MicA54-418.

### THE RELATIONSHIP BETWEEN RESEARCH IN PHYSICAL EDUCATION, INTER- SCHOOL ATHLETICS, AND SCHOOL RECREATION, AND THE MAJOR DEVELOPMENTS IN THESE FIELDS, 1895 TO 1940

(Publication No. 7120)

Edwin Henry Trethaway, Ph.D.  
New York University, 1953

#### Problem

The purpose of this study is two-fold (1) to determine the nature and scope of the research in physical education, interschool athletics, and school recreation from 1895 to 1940, and (2) to determine the relationship of this research to the major developments in the three fields.

#### Sub-Problems

1. Determination of the nature and extent of the available researches.

2. Analysis of the methods used in studying problems and the techniques used in collecting data.

3. Determination of the areas where research has been emphasized and neglected.

4. Study of the relationships between the research undertaken and the major developments.

#### Procedures

The titles of 3083 researches were collected and analyzed. These consisted of masters' and doctors' theses, and studies not classified as theses. Both primary and secondary sources were utilized in studying the major developments.

The data were classified for treatment according to (1) historical periods, 1895-1917, 1918-1929 and 1930-1940, and (2) the following professional functions: Interpretations and Objectives; Social Aspects; Knowledge About People Program; Leadership; Administration; History and Trends; and the Profession.

An analysis was made of a sampling of 789 investigations undertaken between 1895 and 1940 to determine (1) the methods used in conducting research, (2) the techniques employed in collecting data, and (3) the distribution of people studied according to (a) age and (b) geographic location.

### Findings and Conclusions

A few of the general findings in this study are as follows:

1. The most productive years in the conduct of research have been 1930 and 1940.
2. The production of scientific investigations is directly related to the number of institutions of higher learning that offer graduate work and to the number of students who are seeking graduate degrees.
3. Scientific study related to the major developments in physical education took place in the period following the one in which a development or trend first became evident.
4. The research methods that have been utilized the most frequently in masters' theses are the questionnaire, correlation, and documentary frequency methods. Those employed the most often in doctoral dissertations are the correlation, survey appraisal, and experimental methods. Studies, other than theses, favored the survey testing, experimental, and questionnaire procedures.
5. High school and college students have been used more frequently as subjects of research than elementary school pupils.
6. The development, application, and refinement of tests and measurements constituted a major development in physical education research between 1895 and 1940.
7. The scientific movement in physical education, which developed rapidly after 1930, was a major factor in stimulating the production of research related to the physiological and psychological types of investigations, particularly those that were conducted under laboratory conditions.
8. Scientific study of those activities which have leisure time and recreational values, did not take place to any great extent until the 1930 period, when recreation as an objective of physical education was stressed. Prior to that time a comparatively small amount of research was devoted to individual and dual activities.
9. Research on the following activities has been neglected almost entirely: speedball, water polo, deck tennis, table tennis, shuffleboard, squash, horseshoes, water games, skating, skiing, and hiking.
10. There is a need of more research with respect to the methods of teaching and learning, and the measurement of skills and knowledge, in the following activities: badminton, bowling, canoeing, fencing, field hockey, games of low organization, handball, lacrosse, softball, touch football, and volley ball.

Microfilm copy of complete manuscript of 826 pages, \$10.33. Enlargements 6" x 8", 10¢ per page. Library of Congress card number MicA54-419.

### THE RELATIONSHIP OF SELECTED TESTS WITH ENERGY METABOLISM AND SWIMMING PERFORMANCE

(Publication No. 6989)

Wayne Daniel Van Huss, Ph.D.  
University of Illinois, 1953

#### Purpose

The opinions of teachers and coaches of swimming regarding the importance of the abilities associated with speed swimming vary rather widely. This study was undertaken to determine the interrelationships and relative importance of the energy metabolism measures obtained in all-out static swimming, of selected cardiovascular tests and of the practical diagnostic swimming tests to 100-yard and 440-yard swimming performance. The focus of emphasis was to determine the values of the metabolic measures.

#### Methodology

A sample of 41 college swimmers between the ages of 17 and 23 years consisting of 37 varsity swimming team candidates and 4 champions was tested on a battery of 52 metabolic, cardiovascular and swimming tests. Standard error of measurement values were obtained on the pool metabolic tests. The basic measures were all intercorrelated by machine techniques and the data checked for linearity. Two sets of criteria were then set up: (1) The metabolic criteria consisting of the gross oxygen debt. (2) The swimming performance criteria consisting of 100-yard and 440-yard swimming times. Multiple regression analyses were completed to select the most representative measures from each of the testing areas. The better measures from each of the testing areas, as determined by multiple regression analysis, were then combined in further multiple regression analysis to determine the relative importance of the measures to the respective criteria.

#### Findings

The gross oxygen intake and gross oxygen debt, of the metabolic measures were found to correlate best with both the 100-yard ( $r = .355 \pm .095$  and  $.448 \pm .088$ , respectively) and 440-yard swimming performance ( $r = .541 \pm .076$  and  $.576 \pm .071$ , respectively).

The Heartometer pulse wave diastolic amplitude ( $r = .495 \pm .080$ ) and the swimming with legs alone 60 foot tests ( $r = .466 \pm .084$ ) were relatively the most important measures for predicting the gross oxygen intake when the best swimming and cardiovascular tests were combined ( $r = .658 \pm .364$  liters/minute). The cardiovascular measures, Heartometer rest/work ratio ( $r = .429 \pm .087$ ) and systolic amplitude ( $r = .479 \pm .082$ ) and the diastolic blood pressure taken during the fifth minute of recovery ( $r = .273 \pm .099$ ) following the all-out static swim were relatively more important for predicting gross oxygen debt when the best cardiovascular and swimming tests were combined ( $R = .789 \pm 1.599$  liters/minute).



The metabolic, cardiovascular and swimming measured selected in earlier multiple regression analyses were combined in secondary multiple regression analyses to predict 100-yard ( $R = .815 \pm 4.99$  seconds) and 440-yard swimming performance ( $R = .865 \pm 38.45$  seconds). In the 100-yard analysis the simple swimming tests contributed 96.5 percent of the total predictive variance of the seven best tests. The 100-yard drop-off test was the most important single test contributing 58.2 percent of the total variance. In the 440-yard analysis two simple swimming tests, legs alone 60-foot and 24-foot gliding time contributed 85.43 percent of the total predictive variance of the seven best tests.

#### Conclusions

1. The abilities measured by the previously established diagnostic swimming tests are relatively more important to 100-yard and 440-yard swimming performance than the capacities measured by the cardiovascular and metabolic tests.
2. The capacities measured by the gross oxygen debt and the 100-yard drop-off test are of more relative importance to 100-yard than 440-yard swimming performance.
3. The capacities measured by the gross oxygen intake and legs alone 60-foot and 24-foot glide time swimming tests are of more relative importance to 440-yard than 100-yard swimming performance.
4. The metabolic, cardiovascular and swimming tests in combination relate better generally to 440-yard than 100-yard swimming performance.
5. A finding which closely corroborates the work of Craig Taylor and Paul Hunsicker is that the oxygen measures contribute such a small part in the total predictive variance in the criterion swimming measures.

Microfilm copy of complete manuscript of 171 pages, \$2.14. Enlargements 6" x 8", 10¢ per page. Library of Congress card number MicA54-420.

#### EDUCATION, PSYCHOLOGY

##### A FOLLOW-UP STUDY OF GRADUATES OF SPECIAL CLASSES FOR GIFTED CHILDREN

(Publication No. 7014)

Walter B. Barbe, Ph.D.  
Northwestern University, 1953

Although many studies have been made which reveal the nature and needs of gifted children, there is little evidence that the school curriculum has been changed to provide adequately for this group. However, a number of attempts have been made to enrich the education of the gifted child in special ways. One of these is the special class. In spite of the apparent success of programs for the gifted which employ homogeneous grouping, educators have been re-

luctant to accept this type of special provision. Few of these programs have been evaluated thoroughly. Therefore, it has been difficult to affirm or to deny the criticisms so often made of special classes.

#### The Problem

The purpose of this study is to follow up a group of gifted children who have graduated from high school within the past 15 years and to evaluate the special type of education which they received. All of the subjects were students in the special classes for gifted children in Cleveland, Ohio. By means of a follow-up study of these graduates, it is hoped that the effectiveness of special classes for gifted children may be indicated.

The research reported in this dissertation was planned to make available data pertinent to these questions:

1. To what extent do superior children identified as gifted in elementary school justify expectations by their accomplishments after they finish high school?
2. To what extent does this particular group of gifted youth conform to the patterns of gifted groups studied by other investigators?
3. As adults, how do these former members of classes for the gifted now evaluate the education which they received?

#### Procedure

A five-page printed questionnaire, containing 77 questions, was mailed to all high-school graduates of the Major Work Program in Cleveland, Ohio between the years of 1938 and 1952. Information was requested in six areas: (1) Family background; (2) Educational status; (3) Occupational achievement; (4) Physical condition; (5) Interests and adjustments; and (6) Opinions of the Major Work Program.

Replies were received from 456 subjects, a 76.9 per cent return of the net sample, exclusive of losses. The subjects were then divided into four groups depending upon the year in which they had graduated from high school.

#### Summary of Findings

It was apparent from the data that the classes contained individuals from all economic levels and racial and religious backgrounds. Practically all of the men and two-thirds of the women attended college. Eighty-three per cent were above average in their college work and only 1.5 per cent were below average. In terms of occupational choice, level of income, and frequency of promotion, most of the men and many of the women were living up to expectations. The interests of the subjects are numerous and varied. Their adjustment to their jobs, school, and to life in general is excellent. In all respects, the achievements and adjustments were very superior. When compared with the results of other investigators, the group was as superior, or more so, in almost every respect.

Microfilm copy of complete manuscript of 251 pages, \$3.14. Enlargements 6" x 8", 10¢ per page. Library of Congress card number MicA54-421.

**A COMPARATIVE STUDY OF MENTALLY  
RETARDED AND MENTALLY NORMAL BOYS  
OF THE SAME MENTAL AGE ON SOME  
ASPECTS OF THE READING PROCESS**

(Publication No. 6936)

Lloyd Murray Carson Dunn, Ph.D.  
University of Illinois, 1953

**Purpose**

The purpose of the investigation was to compare mentally retarded and mentally normal boys of the same mental age on some aspects of the reading process.

**Method**

Subjects were twenty mentally retarded white boys attending special classes in Danville (Illinois), and thirty mentally normal white boys who were selected at random from regular classes in elementary schools in the same school system. Stanford-Binet mental ages of both groups ranged from 8-0 to 10-0.

Each subject was administered: Durrell-Sullivan Reading Capacity Test; Progressive Achievement Tests of Arithmetic Fundamentals and Arithmetic Reasoning, Primary Battery; Monroe (Ayers) Oral Test of Spelling Achievement; Gates Advanced Primary Reading Tests; Monroe Word Discrimination Test; Gray Oral Paragraph Reading Test; Iota Word Recognition Test; Monroe and Gates Tests of Sound Blending Ability; a non-standardized test of ability to use context clues. Reading errors of the fifty subjects were analyzed. Eye-movements were photographed using the ophthalmograph. Speed of recognition of tachistoscopically presented printed materials was measured. A pure-tone audiometric test was given to each subject. Visual efficiency was measured by means of the Keystone Visual Survey Test. Handedness and eyedness were determined. Teacher questionnaires were used to measure pupil adjustment and home conditions.

Inferential statistics were used to make three analyses of the data. First, a comparison was made of the scores obtained by the retarded and normal groups. Second, scores of the ten poorer readers in the retarded group were compared with those of the ten better readers. Third, the ten better readers in the retarded group were matched on average reading achievement with ten normal subjects, and their scores compared.

**Conclusions**

Insofar as could be ascertained from the test materials used in the present investigation, the following conclusions are suggested relative to the reading process of mentally retarded, white boys of mental ages 8-0 to 10-0, selected and placed in special classes according to standards used in the State of Illinois.

As a group, they read markedly below their mental age expectancy level, and below the reading level of mentally normal boys of comparable mental ages. They are also decidedly retarded in spelling, and in arithmetic reasoning. In arithmetic fundamentals,

however, they tend to work up to their mental age expectancy level.

As to qualitative aspects of the reading process, clear-cut differences appear to exist between mentally retarded and normal boys of the same mental age in ability to use context clues; retarded boys are very inferior in this skill. While reading, they tend to make more faulty vowels and omissions of sounds than mentally normal boys; they make significantly fewer repetitions. There would appear to be no differences between the two groups of boys in tendency to make reversal errors, in handedness, in mixed lateral preference, or in speed of recognition of phrases and words.

A number of other factors probably do contribute to the general reading disability of mentally retarded boys. As compared with mentally normal boys of comparable mental ages, they tend to have an excessive number of hearing and vision difficulties. On the basis of teacher ratings, they appear to be more maladjusted, and to come from inferior home backgrounds; parent-child relations in the homes of handicapped children tend to be particularly poor.

Microfilm copy of complete manuscript of 210 pages, \$2.63. Enlargements 6" x 8", 10¢ per page. Library of Congress card number MicA54-422.

**EVALUATION OF THE EDUCATION WORKSHOP**

(Publication No. 6881)

Sumner Burton Morris, Ed.D.  
Stanford University, 1953

This study deals with techniques of evaluating the educational workshop. The problem was to identify how the effectiveness of a workshop could best be determined. Methods that have been used to evaluate workshops were reviewed critically, and evaluation techniques that could best be utilized in light of generally accepted principles of measurement were suggested.

A review of professional literature was made as an initial step to determine the general characteristics and basic nature of the workshop. A consensus of ten characteristics was identified in the professional writings of workshop proponents. As the workshop is conceived by these writers, it strongly emphasizes a participant-centered program based on the professional problems and needs of the participants. Intra-group expression and informality which, it is assumed, will create more direct, open discussion of professional problems and issues are basic requisites.

Investigation of the nature of evaluation processes was a following step. Attention was focused on ferreting out evaluative criteria. Specific techniques and devices used in evaluations were also sought.

It was found that evaluators of the workshop basically have attempted to determine if the workshop experience had a significant effect on the feelings and attitudes and resulting professional behavior



of its participants. As criteria, they have considered such factors as observable changes in the professional life of the participant, an appraisal of feelings and attitudes about the workshop, professional planning developed as a result of the workshop experience, and other tangible outcomes.

Evaluators have relied predominantly on open-ended questioning of participants at the termination of the workshop. Open-ended questions, check lists, and rating scales, questionnaires and interview schedules are the principal devices appearing in reports of evaluations. They may be used as self-appraisal devices by participants or in observational reporting by non-participants. The more objective, sophisticated techniques, such as check lists, scaling, and a careful coding of responses, do not appear to be used often. Reporting of findings from these evaluative efforts is highly subjective. Frequency counts and percentages of response per category are ordinarily used.

Several general criticisms of workshop evaluations were indicated as follows:

1. Failure to determine objectives and state them clearly and in operational terms.
2. The lack of definitive criteria.
3. Too great emphasis on immediacy - on the participants' immediate attitudes and feelings about the value of the workshop.
4. Insufficient attention to careful techniques of instrument construction.
5. Frequent failure to apply sophisticated methods of quantitative analysis in the treatment of the findings.
6. Failure to explicate relationships between findings and actual workshop program and process.
7. Frequent failure to observe accepted sampling procedures. An actual workshop, held at Fresno, California, was reviewed in its entirety to add reality and specificity and to serve as a locus for application of the criticisms of workshop evaluations. Limitations of the evaluation of this specific workshop were indicated. A more intensive procedure was utilized than what had been applied to most other workshop evaluations. However, this particular evaluation was criticized in terms of a lack of pre-workshop determination of objectives and evaluative criteria and a lack of pre-testing of stimulus items.

Among the recommendations made as a consequence of both the analysis of the literature and the experience of evaluating the Fresno Workshop were the following:

1. Greater emphasis on follow-up types of procedure.
2. Utilization of observations by co-workers.
3. Greater emphasis be given to defining objectives and evaluative criteria in advance.
4. More refinement should be exercised in the development and use of evaluative instruments.
5. Increased attention to sampling.

Microfilm copy of complete manuscript of 130 pages, \$1.63. Enlargements 6" x 8", 10¢ per page. Library of Congress card number MicA54-423.

## THE RELATIONSHIP BETWEEN ACHIEVED GROWTH IN HEIGHT AND THE BEGINNING OF GROWTH IN READING

(Publication No. 6854)

Thomas Pomphert Francis Nally, Ph. D.  
Michigan State College, 1953

The purpose of this study is to attempt to determine with precision the relationship between achieved growth in height and the beginning of growth in reading, in the belief that such a relationship will enable the user, under constant conditions, to predict within fairly narrow limits the time at which a specific individual should be ready to read.

The data for this research, consisting of 77 cases - 42 boys and 35 girls - were selected from the more than 300 cases which constitute the "Dearborn Data."<sup>1</sup> These data are longitudinal in nature and are the result of approximately ten years of measurement during the period from kindergarten through the ninth grade.

Those cases which were complete and which were found to contain three or more measurements in the preadolescent cycle of growth in both reading and height were selected for this study.

The Gompertz function,<sup>2</sup> as applied by Curtis,  $y = k[rt + i]$ , where  $y$  = achieved growth,  $k$  = maximum,  $r$  = rate,  $i$  = incipency,  $t$  = variable time, and  $[ ]$  = isochronic value, was utilized in this research. This function adequately describes growth phenomena when maturation is a factor within an average error of  $\pm 2$  per cent.<sup>3</sup>

Equations were formulated for the preadolescent cycle of maturation in reading and in height for each of the 77 cases. The reading equations were solved for 0.1 per cent of development in order to determine "t," i.e., chronological age at which reading theoretically begins. This chronological age, "t," was then substituted into the equations of height and these equations were solved to determine the per cent of development in height for the preadolescent cycle of growth each individual had achieved. Distributions were made for the chronological age of reading incipency and percentage of development in height.

These data concur with the general literature in two aspects: (1) A beginning reading of  $77.7 \pm 2.9$  months for boys and  $77.5 \pm 3.3$  months for girls was obtained. This concurs with the 78 months reported in the literature. (2) The rate of growth of girls exceeded that of the boys at the 10 per cent level of confidence.

The 42 boy cases were found to begin reading at a mean per cent of  $72.4 \pm 1.2$  per cent of development in height. Similarly, the 35 girl cases were found to begin reading at a mean per cent of  $76.3 \pm 1.2$  per cent of development in height. Little relationship was found between per cent of development in height and chronological age at which reading began. Pearson Product Moment Coefficients were 0.16 for the girls and 0.27 for the boys, respectively.

The range of per cent of development in height, 10.6 per cent for the boys and 8.7 per cent for the

girls, when changed to equated units (months) is much smaller than that of chronological age of reading incipency. This equated range was 18.4 months for the boys and 15.5 months for the girls as compared to 29.2 months and 31.5 months, respectively.

Since development in height appears to bear a predictive relationship to reading incipency, it would seem desirable to further test its usefulness in planning the reading curriculum and also as a possible means of alleviating failure in reading through individual analysis.

The value of the Gompertz function as applied by Courtis, for describing relationships in both educational and physical data, should be investigated further. This method of approach is unique and must be considered a major contribution of this study to educational research.

1. Collected by C. V. Millard at the Henry Ford School, Dearborn, Michigan, and available at the Child Development Laboratories, Michigan State College, East Lansing, Michigan.

$$2. y = ki^r$$

3. Courtis, S. A. *The Measurement of Growth*. Ann Arbor, Michigan: Brumfield and Brumfield, 1932.

Microfilm copy of complete manuscript of 121 pages, \$1.51. Enlargements 6" x 8", 10¢ per page. Library of Congress card number MicA54-424.

#### THE SCHOOL ADJUSTMENT OF CHILDREN WITH AURAL ACUITY DIFFICULTIES

(Publication No. 6883)

Lyle Gordon Reynolds, Ed. D.  
Stanford University, 1953

The hypothesis to be tested was that school children with a mild to moderate hearing loss do not adjust as satisfactorily to their school environment as do normally hearing pupils.

Audiograms belonging to the San Francisco City Schools obtained with the Western Electric 6-B audiometer were studied to obtain 36 hypacusic children. The criteria for admission to this group were (1) a minimum hearing loss in the better ear of 15 decibels at each of three frequencies, 512, 1024, and 2048 cycles per second, or twenty decibels loss at any two of these frequencies, or twenty-five decibels loss at any one, (2) attendance in a San Francisco public junior high school, (3) a record of hearing impairment for six or more months with two or more audiograms indicating impairment, (4) last audiogram on file indicating impairment must have persisted into the current year, (5) sufficient intelligence to be enrolled in regular school classes, (6) same audiometrist must have drawn last audiogram, (7) enrollment in lip-reading classes, (8) the pupil could not be wearing a hearing aid, and (9) completeness of other school records.

The mean average hearing loss for the group selected over these three frequencies was 21.26 decibels. The average period of time these children had

records of impairment was 4.29 years.

Children with normal hearing were then matched with the hypacusic group on the bases of (1) chronological age within six months, (2) sex, (3) attendance in the same school at the same grade level, (4) non-language mental age within six months obtained with the California Short-Form Test of Mental Maturity, (5) race, and (6) a rough evaluation of parental occupational status. The data necessary to accomplish the matching was made available to the writer by the schools.

The average non-language I.Q. of the hypacusic group was 97.47 while that of the controls was 97.67. The difference between these means is not significant. Hence, it was concluded that matching had been adequate with respect to chronological and non-language mental age.

The criteria used to measure school adjustment were (1) educational achievement as measured by the California Achievement Tests, (2) absences from school with excused absences for medical reasons excluded, (3) personal and social adjustment as measured by the California Test of Personality, and (4) ratings by teachers on behavior and personality traits along a five point scale devised by the writer.

School records were used to obtain achievement scores on reading, arithmetic, spelling, and the total test. Each child in the study was rated by (1) a teacher of academic subjects on the ten-item scale, (2) a teacher of non-academic subjects on the same scale, (3) a Physical Education teacher on a six-item scale, and (4) the Assistant Principal on a two-item scale. In most cases it was possible to have the same teacher rate both members of a matched pair.

Small sample methods were used to test for statistical significance of the differences between the mean scores of the two groups on these measures of adjustment. Fifty-one tests were made, and out of these, the controls were favored in all but 17. However, none of the t-ratios obtained reached the criterion necessary to demonstrate significance at the one per cent level. Ratings of Physical Education teachers came nearest to identifying group differences. Two were significant at the two per cent level, one at the three per cent level, and one at the five per cent level.

Since none of these are significant at the one per cent level, we must conclude that these hypacusic children adjust as favorably to their school environment as do their normal partners.

Microfilm copy of complete manuscript of 197 pages, \$2.46. Enlargements 6" x 8", 10¢ per page. Library of Congress card number MicA54-425.



**THE RELATION BETWEEN THE PERCEPTION OF  
MOVEMENT ON THE RORSCHACH TEST AND  
LEVELS OF CONCEPTUALIZATION: AN EXPERI-  
MENTAL STUDY AND THEORETICAL ANALYSIS  
OF THOUGHT PROCESSES INVOLVED IN  
THE PERCEPTION OF MOVEMENT  
ON THE RORSCHACH TEST**

(Publication No. 7113)

Irving Schulman, Ph. D.  
New York University, 1953

**The Problem**

This study evaluates the relation between movement perception on the Rorschach test and levels of conceptualization. The following specific problems are dealt with: (1) the relation of movement perception to Abstract, Functional and Inadequate concept formation; (2) the presence of movement responses and levels of concept formation in age and nosological categories; (3) an examination of theories of movement perception in light of data produced in this study; (4) formulation of a rationale of movement perception.

**Methods and Procedure**

The method of investigation involves the analysis of two hundred two psychological test batteries administered to patients at the Western Psychiatric Institute and Clinic, Pittsburgh, Pa. The patients include Neurotic, Schizophrenic, Brain Damaged, and Affective Psychotics. The tests evaluated include the Rorschach test, from which was derived movement scores, and the Object Sorting test and Similarities test of the Wechsler-Bellevue Adult Intelligence Scale (Form I), which yielded concept formation scores.

The data were evaluated by computing product-moment correlations between movement and concept formation scores; by computing "t" tests to determine the significance between mean movement scores in diagnostic groups, age groups, and groups whose Similarities test score falls at various quantitative levels; and by computing "t" tests to determine the significance of the difference between mean Abstract and Inadequate concept scores in diagnostic groups, age groups, and groups with various movement percentages.

**Results**

Human movement tends to correlate positively at a significant level of probability with Abstract concepts and Similarities scores, and negatively at a significant level with Inadequate concepts. No significant correlation with Functional concepts is noted. Neurotics gave the highest mean M per cent, and Brain Damaged the lowest.

Animal movement tends to correlate positively at a significant level with Abstract concepts, and negatively at a significant level with Inadequate concepts. Functional concepts show no significant association with any animal movement factor. Neurotics gave the highest mean FM per cent, and Schizophrenics the lowest.

Inanimate movement tends to show significant

positive association with Abstract concepts and a significant negative correlation with Inadequate concepts. Similarities scores correlate positively and significantly with accurate Inanimate movement. There is no association with Functional concepts. Neurotics gave the highest mean inanimate score and Affective Psychotics the lowest.

There is no significant variation of total movement scores in the age groups. Neurotics gave the highest mean total movement plus percentage and Schizophrenics the lowest; whereas Schizophrenics had the highest mean total movement minus and Affective Psychotics the lowest. Obsessives gave less total movement than other Neurotics, whereas Paranoids gave less total movement than other Schizophrenics.

No significant variations in mean Abstract or mean Inadequate scores exist at the various age levels. Neurotics gave the highest number of Abstract and lowest number of Inadequate concepts; whereas, the Brain Damaged gave the fewest Abstract concepts and the most Inadequate. Obsessive-Compulsives gave a lower Abstract score than other Neurotics, whereas Paranoids gave a slightly higher Abstract score than did the other Schizophrenics.

**Conclusions**

It is concluded that movement responses, and particularly accurate movement responses, tend to be associated with abstract conceptual ability, thereby supporting the hypothesis of this study. A rationale of movement perception is formulated by integrating the results of this study with available theoretical knowledge of concept formation and existent interpretations of movement perception.

Microfilm copy of complete manuscript of 165 pages, \$2.06. Enlargements 6" x 8", 10¢ per page. Library of Congress card number MicA54-426.

**EDUCATION, TEACHER TRAINING**

**PLANNING A STUDENT TEACHING  
PROGRAM FOR PROSPECTIVE HIGH  
SCHOOL SCIENCE TEACHERS**

(Publication No. 7126)

Ralph Lea Beck, Ed. D.  
New York University, 1953

**The Problem**

The purpose of this study was to determine the nature and status of student teaching programs in science in Ohio at the high school level, and to make recommendations indicating the areas in which changes should be made in order that the student teaching programs may follow the standards set forth by the American Association of Colleges for Teacher Education in cooperation with the Association for Student Teaching.

Data for this document were obtained through the use of three forms of a questionnaire and through personal interviews. The personnel consisted of college and university directors of student teaching and supervisors of student teaching, high school supervising teachers, in science, and student teachers assigned in high school science in the laboratory and/or cooperating schools of the colleges and universities participating in this study. Thirty-two of the 44 colleges and universities which had students enrolled in student teaching in science in the academic year 1952-53 participated in this study.

The recommendations made were confined entirely to the policies and practices in student teaching in science in the colleges and universities which participated in this study.

### Major Findings

Supervision of student teaching in a minor part of the assigned duties of college and university staff members reported in this study.

From one to three public schools with an enrollment of 800 or fewer pupils in the upper six grades, with three or fewer student teachers assigned in science, is the typical high school which was utilized for student teaching in Ohio at the time of this study.

Opportunities for professional laboratory experiences on the part of student teachers, aside from classroom teaching, are, in general, very limited.

Student teachers are relatively free in the selection of methods of teaching and in the selection of instructional materials in the courses which they teach in the laboratory and/or cooperating schools.

Frequent, unscheduled, follow-up conferences between supervising teachers and their student teachers are common. College and university supervisors, in general, observe their student teachers in science from three to five times during their student teaching assignments and hold as many conferences with each student teacher. Follow-up conferences, in general, are of about 30 minutes duration.

### Conclusions and Recommendations

There is need for a full-time student teaching program, i.e., spending the entire school day in a given laboratory and/or cooperating high school for a period of consecutive weeks, which is extended over the same number of weeks as are commonly found in institutions which assign student teachers on a one or two period per day basis, or about 15 weeks.

Full-time student teaching would provide opportunities for student teachers to engage in a majority of the necessary professional laboratory experiences in addition to responsible teaching.

Instructional loads of college and university staff members, assigned to supervisory duties, should be adjusted to provide time for more adequate supervision of student teaching.

There is need for more exacting requirements for admission to student teaching.

There is need for greater flexibility regarding the nature and extent of professional laboratory experiences for student teachers prior to and including

student teaching.

Student teachers should be assigned in more than one science and successively to more than one school.

All professional laboratory experiences should have continuity and should be integrated more closely with college courses throughout the four years of college.

There is need for better orientation of student teachers to the school communities in which they are assigned for student teaching.

Guidance and evaluation of professional laboratory experiences including student teaching should be the joint responsibility of college or university supervisors and the supervising teachers.

Microfilm copy of complete manuscript of 174 pages, \$2.18. Enlargements 6" x 8", 10¢ per page. Library of Congress card number MicA54-427.

### INSTITUTIONAL APPRAISAL OF FIVE-YEAR PROGRAMS FOR THE PREPARATION OF SECONDARY-SCHOOL TEACHERS

(Publication No. 6863)

Elizabeth Jane Boyter, Ed. D.  
Stanford University, 1953

This study was undertaken with the assumption that a guide for planning and improving five-year programs for the education of secondary-school teachers could be devised from knowledge gained from writers in the field and from educators working in five-year programs. To secure this information a self-appraisal schedule was adapted from the Accreditation Schedule of the California Joint Committee and sent to those institutions preparing secondary-school teachers where five years of preparation are required, Arizona, California, New York, Washington, and the District of Columbia.

The study was designed to yield information with regard to the commendable practices in programs of selective admission and retention, general education, professional education, student teaching, and preparation in the academic teaching major. By commendable practices are meant those present practices and suggestions for improvement judged desirable by staff members of participating institutions and those practices recommended in the literature.

### Findings - Commendable Practices

Selective Admission and Retention: Committees on Admission use existing empirical evidence along with intelligent hypothetical criteria for the selection of teacher candidates. These committees provide for early initial selection and use a variety of subjective and objective data for both initial selection and yearly reviews of qualifications.

General Education: Programs of general education have a four-year sequence with emphasis in the first two years, a core pattern of requirements plus a counseling approach with regard to electives, a



divisional organization, an integrating core of courses in philosophy, religion, or an equivalent with a proportionate recognition of literature, social science, language, science, and the arts.

**Professional Education:** Professional education begins in the sophomore or junior year. Methods and observation courses are given prior to student teaching. A synthesizing seminar is required as a culminating experience. A variety of realistic experienced affords a functional program. Close cooperation among staff members involved in the education of teachers is secured by joint appointments or frequent meetings.

**Student Teaching:** A short period of student teaching while taking courses at the college and a minimum of one full quarter of extra-mural experience are required. Appropriate teaching aids are provided in the laboratory schools. Experiences provided are as extensive as those of a modern teacher devoted to his calling. The student teacher has access to the advice of the resident teacher, college supervisor, and major field specialist. Definite measures are taken that all involved in the program understand and appreciate the objectives of the college's program.

**Academic Teaching Major:** Subject matter specialists are experts in their fields and competent teachers. The content of courses in major fields is broad, scholarly, and at the same time related to what is taught in the secondary-school. Cooperative planning by all faculty members who share in the education of teachers is a strong point in the program.

#### General Observations and Implications

There is need for further research to compare five and four year programs.

In many institutions there is need for more systematic planning of programs in order to provide an integrated five-year sequence rather than a three or four year liberal arts course with professional education added on. This may be facilitated if all faculty members concerned with the education of teachers work together in formulating a definition of teacher competences and the specific functions of their program. The same persons should jointly relate these functions to specific courses and experiences and allocate among themselves the responsibility for performing them.

Every effort should be made to correlate theory and practice by providing more frequent contacts with youth and more adequate community experiences.

Microfilm copy of complete manuscript of 262 pages, \$3.28. Enlargements 6" x 8", 10¢ per page. Library of Congress card number MicA54-428.

#### A SOURCE BOOK IN TRAINING CHRISTIAN EDUCATION LEADERS: PREPARED FOR USE IN HARDING COLLEGE, A COLLEGE OF THE CHURCHES OF CHRIST AT SEARCY, ARKANSAS

(Publication No. 7127)

Russell Carroll Cannon, Ed.D.  
New York University, 1953

#### Problem and Limits

The purpose of the project was to develop a source book in training Christian education leaders in the graduate school of Harding College, Searcy, Arkansas for leadership in the educational program of Churches of Christ. It was developed for use in a one year graduate course of study leading to the Master of Arts degree in Christian education at Harding College. It was limited to providing sources for the following areas: philosophy of Christian education, curriculum of Christian education, and methods in Christian education.

#### Procedure

1. Basic source materials were selected and presented to professors in the particular fields with which the project is concerned for their evaluation in terms of comprehensiveness and thoroughness.
2. Data were collected from the validated sources and filed under seven categories which were the same for each of the three major areas: aims, motivation, procedure, evaluation, content, suggested lesson plans, and supplementary materials.
3. Interviews were held with professors of Christian education in New York University, Union Theological Seminary, and Biblical Seminary for the purpose of collecting additional data for the project. The procedure was the same as that described in step two above.
4. After the first draft of the project was completed it was presented to a jury composed of three professors in Christian education for validation.
5. The final draft was written with full consideration given to the criticisms and suggestions of the jury and sponsoring committee.

#### Findings and Conclusions

1. The completed source book represents a contribution to the curriculum of professional higher education conducted by the Churches of Christ, in that it gathers together in valid and functional form a wide and representative group of materials in Christian education and arranges them for use in training Christian education leaders with the following aims:

- a. To assist the students in developing a meaningful philosophy of Christian education which is integrated both with their theological insights and their understandings of the psychology of learning.
- b. To assist the students in acquiring an understanding of the relation between the church and the community, and an awareness of the function of the various agencies of each in regard to Christian education.

c. To assist the students in developing a working theory of curriculum which is both Christian and educationally valid.

d. To assist the students in an understanding of the function of worship, study, fellowship, and service as varied experiences in which the curriculum actually comes to life as a creative process of Christian growth and development.

e. To assist the students in an understanding of the function of the teacher as one who interprets, enriches, and guides experience.

f. To assist the students in acquiring an understanding of methods which sees method as a significant part of the curriculum and an important factor in determining attitudes and character in the learning process.

g. To assist the students in acquiring the understandings and skills which will enable them to use effectively those methods which will make the experiences of learning most creative.

2. The source book provides a thoroughgoing plan for conducting at Harding College the training needed for Christian education leaders of the Churches of Christ in the three basic fields of philosophy of Christian education, curriculum of Christian education, and methods in Christian education.

Microfilm copy of complete manuscript of 216 pages, \$2.70. Enlargements 6" x 8", 10¢ per page. Library of Congress card number MicA54-429.

# COMMUNITY ACTIVITIES OF RURAL ELEMENTARY TEACHERS: A STUDY OF THE COMMUNITY PARTICIPATION OF NEGRO RURAL ELEMENTARY TEACHERS IN LOUISIANA

(Publication No. 7128)

Gladys Blanson Collins, Ed. D.  
New York University, 1953

The participation of teachers in community activities is conceded to be essential to the improvement and enrichment of community life. There is a need for teachers in rural communities who are not only good classroom teachers, but who are also trained to assist in the solution of rural community problems, and to enrich rural life educationally, socially, economically, and culturally.

This study was undertaken because of the pressing concern regarding the adequacy and relevancy of the training of rural teachers already in the field relating to effective and efficient community participation; and, the extent to which the participation of teachers in rural community activities is influenced by the training they received.

Three major points of reference in this study are: first, that the preparation of teachers for active community participation is the responsibility of the teacher-preparing institutions; second, that pre-service educational experiences geared to community participation will yield more effective teacher service in rural communities; and third, that this

effectiveness will show up when contrasted with the activities and problems of a comparable group of teachers educated at other institutions.

Data concerning the community participation of rural elementary teachers were secured through: a study and analysis of a pre-service program for community participation; a questionnaire, including a check list of community activities implied in the pre-service curriculum, submitted to a group of graduates from the pre-service program and a group of graduates of other teacher-preparing institutions who were employed as teachers in rural communities; and, interviews conducted with selected teachers in the study and their Jeanes Supervisors.

Findings in the study were:

1. There are no substantial differences in the extent of participation or the kinds of activities in which the two groups of teachers trained at different institutions with different emphases engage in rural communities.

2. The rural teachers tend to perform most frequently those activities which they judge to be least important.

3. There is little agreement among the teachers in both groups regarding the importance of certain community activities for community enrichment and improvement. They are not in even close agreement with the faculty of the teacher-preparing institution in regard to the importance of activities.

4. Problems in community participation tend to persist in spite of the experience or training of the teachers.

5. There is no consensus among or between the two groups in regard to where a teacher should learn to perform the community activities listed.

Since the effect of training emphases was not established in the study, one may conclude that the graduates of a pre-service program with educational experiences geared to community participation have not been able to incorporate the program's philosophy and respond to their jobs in the manner for which they were trained.

It is, therefore, recommended that the teacher-preparing institution either strengthen its pre-service offerings to increase the prospective teacher's community consciousness and awareness of the teacher's out-of-class responsibilities in a community, or select more able students from the standpoint of ability, initiative and interest.

Microfilm copy of complete manuscript of 213 pages, \$2.66. Enlargements 6" x 8", 10¢ per page. Library of Congress card number MicA54-430.



# AN ANALYSIS OF THE EVALUATION, USE, AND VALUE OF CERTAIN COMPETENCIES FOR BEGINNING THE STUDENT TEACHING EXPERIENCE

(Publication No. 6851)

Ross Jean Fligor, Ph.D.  
Michigan State College, 1953

This study was concerned with the readiness of students for the student teaching assignment. Its specific purpose was fourfold: (1) to discover how certain competencies operated in determining readiness for student teaching; (2) to discover techniques by which competence was evaluated; (3) to determine the amount of value placed on each competency studied; and (4) to discover the value attributed to each for an improved teacher preparation program.

The following areas of competence were studied: mental ability, academic ability, knowledge of major field, professional courses, mental health and emotional maturity at the high school and college levels, language facility, understanding of child growth and development, sensitivity to problems and factors affecting a learning situation, abilities necessary for good teaching, physical characteristics, health, background prior to college, experiences as a college student interacting with adolescents and younger children, and professional outlook and interest in teaching.

The method used to obtain data for this study was the questionnaire survey method and the personal interview. Responses were obtained from directors of student teaching and supervisors. The geographical area surveyed coincided rather closely with the area of the North Central Association. The data collected were organized, analyzed, and compared with the opinion of a jury of experts.

The data strongly indicated that a general lack of ability in the areas of competence surveyed retarded the time of admission to student teaching. There was little evidence that demonstrated ability hastened the time of assignment to student teaching.

The methods of evaluation most frequently reported were grades in courses, interviews and conferences, written opinions of competent people, checklists, cumulative records and examinations. The method of evaluation used in the various schools differed with respect to time, types of instruments and minimum requirements to be met. There was definite evidence of a need for improved evaluation procedures in the area of professional laboratory experiences.

The data collected for this study yielded no valid rank order of value of the competencies. However, there was evidence that educators were concerned about the competence of the individual student in terms of his total ability. The weakness of present evaluation instruments and the over-all importance in teacher preparation of some of the competencies studied were cited as evidence of the importance of the total profile of the student.

The concept of readiness was widely accepted at the theoretical level, and some experimental practices were in operation at the practical level. Most

of the areas of competence included in this study were deemed highly important at the theoretical level. There was limited evidence in the data collected to indicate that more experimentation with readiness programs is needed under varying conditions at the practical level.

The evaluation of the students' readiness for student teaching was frequently the responsibility of one individual. The results of the research for this study indicated that the assignment to student teaching should involve more people through a longer period of the students' preparation.

Programs in teacher training indicated a need for cooperative curriculum planning in which directors of student teaching, supervising personnel, departments of education, and other academic personnel work together to improve the total educational pattern of the student teacher.

Microfilm copy of complete manuscript of 230 pages, \$2.88. Enlargements 6" x 8", 10¢ per page. Library of Congress card number MicA54-431.

## TEACHER STEREOTYPES IN THE AMERICAN NOVEL

(Publication No. 6869)

Arthur Raymond Foff, Ed.D.  
Stanford University, 1953

In our culture, education is prized, but educators tend to be contemned. Understanding of this dilemma can be gained by an analysis of the teacher in the American novel. The basic assumption of such a study is that fiction is a reliable source of sociopsychological data.

The present research deals with male and female public schoolteachers on the elementary and secondary levels. While the major focus is contemporary, novels from earlier periods are included. The central sample contains sixty-two novels and 183 characters. To analyze the characters, a form is used that has three major categories: Personal Data; The Teacher in School; The Teacher in the Community. Each category is refined by further subdivisions. Believing that personality and culture are continuous, the research uses both psychoanalytic and sociological methods in its interpretation of data.

The study shows that teachers appear in large numbers in the American novel, and that their characterizations are stereotyped. The incidence of women teachers is twice as great as that of men, indicating that teaching is primarily thought of as a woman's occupation.

The male teacher is the object of a social attitude that is markedly ambivalent. In school, he is usually regarded with affection and respect. Outside of school, he is treated like a familiar stranger. It is expected that he will be in the community, but not of it. His ascribed role insists that he be solitary, effeminate, and impractical. In order to assume this role successfully, the teacher must achieve failure as a man.

The female teacher is also the recipient of an ambivalent attitude. In school, she is predominantly regarded with affection. Out of school, however, she too is regarded as a familiar stranger. She must participate in certain institutionalized activities, but she cannot enjoy warm interpersonal relationships. Restrictions so limit her heterosexual relationships that she is customarily characterized as either a young, unmarried woman or as an old maid. In brief, to become a teacher is to surrender womanhood.

The ambivalence manifested toward the teacher, as well as the concomitant emasculation of the man and desexualization of the woman, may best be understood on a psychological level by realizing that teaching is a parent-surrogate profession. The teacher tends to be liked in the school because it is the unconscious equivalent of the home. Elsewhere, however, the teacher assumes the role of a scapegoat who pays for the real and imagined sins of the parents against the child.

The tradition of Calvinism in the United States provides a major cultural canalization for the flow of ambivalent effects. On the one hand, this tradition sanctions revolt against authority. On the other hand, it equates secular success with spiritual salvation. In the context of an acquisitive society, the teacher is mildly esteemed as a spiritual success and intensely rejected as a material failure. The doctrinal dualism of the value system provides a perfect vehicle for the instinctual dualism of the psychic system.

The disintegration of home and family in modern society is a crucial determinant of the nature of the contemporary stereotype of the teacher. The rapid industrialization and urbanization of our culture, as well as the relative success of the feminist movement, have tended to separate parents from their children. It is regrettable but inevitable that educators should feel the impact of the failure of the home.

In conclusion, the study insists that teaching cannot attain its deserved status as a full profession until the stereotype is shattered. This will depend not only on a recognition by educators of the social image of the teacher, but also on an awareness of the degree to which their own self-concept matches the concept of the community.

Microfilm copy of complete manuscript of 345 pages, \$4.31. Enlargements 6" x 8", 10¢ per page. Library of Congress card number MicA54-432.

#### THE DETERMINATION OF CONTENT AND PROCEDURES OF A BOOKKEEPING METHODS COURSE

(Publication No. 7130)

Paul Edward Froehlich, Ed.D.  
New York University, 1953

This study was undertaken to meet a specific need in the professional improvement of business teachers. The problem was to determine what should be the

content of a bookkeeping methods course on the undergraduate level, as well as to determine what the activities of the student and instructor should be.

The combination interview and questionnaire method was used to secure data from 206 respondents, of whom 183 were instructors in bookkeeping methods, representing all geographical areas of the country.

Business teachers are being trained in a great many small liberal arts colleges, and in a smaller number of universities and teachers colleges. For the large majority, preparation involves almost a complete program of business education; for some, only certain specialized areas.

Comparatively few schools offer special methods courses; even fewer require them. Hardly one-third of the schools offer a special methods course in bookkeeping, the large majority including it as a small segment of a broader general methods course in business education. Business educators urge not only a special bookkeeping methods course, but also, contrary to current practice, very generous professionalization of accounting subject matter.

There is a wide deviation in the time that bookkeeping methods is presented, ranging from the sophomore year to after practice teaching. The recommended time is just prior to practice teaching.

The most troublesome problem facing instructors is the student's lack of mastery of subject matter. Higher standards of achievement in accounting subject matter, as measured by some test of competency, should be a prerequisite to the methods course.

Lack of curriculum time is the second major problem causing inadequate preparation of bookkeeping teachers. More than one-third of all schools surveyed spend ten clock hours or less on bookkeeping methods.

Instructional materials lack in suitability and adequacy. Only twenty per cent of the schools have any written syllabus. Urgently needed are an up-to-date methods text, complete organization of other materials, more practical helps, and audio-visual material.

Many more topics must be taught with much greater emphasis than is current practice; upgrading is needed all the way. Particular emphasis should be given to lesson planning, methods of grading, techniques for creating and holding interest, assignments, blackboard techniques, simplifying subject matter to high school level. There should be special emphasis on how to teach specific topics such as petty cash, payrolls, and related problems, the work sheet, columnar books, and the theory of debits and credits.

Trainees need to demonstrate techniques and participate more actively in practical assignments such as preparing daily lesson plans, teaching from plans before class, keeping a notebook or file of teaching aids.

Although instructors are using for the most part practical methods of presentation such as the blackboard presentation and discussion; the lecture method should be used far less frequently.



The following sequence of topics is suggested for the 45 hour special methods course, with stars indicating content of the 15 hour course: bookkeeping teacher characteristics; \*class organization and management; \*getting started; \*blackboard techniques; accuracy, neatness, penmanship; \*simplifying subject matter; methods of presentation; \*questioning; \*assignments; \*T account; \*transaction analysis; \*theory of debits and credits; accounting principles and terminology; \*lesson planning; \*special journals and ledgers; controlling accounts; \*motivation of interest; individual differences; \*discipline; approaches; bookkeeping cycle; \*adjusting, closing, reversing entries; \*work sheet; \*classification of accounts; locating errors; financial statements, abstracting articles; \*petty cash; \*payrolls; \*social security, withholding taxes; \*selection and use of instructional materials; \*audio-visual aids; \*textbooks; reconciliation statement; bad debts; depreciation; \*community resources; valuation accounts; accrued and deferred items; \*tests, grades, evaluation; interest, discount, notes; vouchers system; \*developmental, drill, review, remedial lessons; historical development; trends; recordkeeping; \*practical applications.

Microfilm copy of complete manuscript of 438 pages, \$5.48. Enlargements 6" x 8", 10¢ per page. Library of Congress card number MicA54-433.

#### PROFESSIONAL ACTIVITIES PERFORMED BY COLLEGE SUPERVISORS OF STUDENT TEACHERS

(Publication No. 6871)

Samuel Gerald Gates, Ed. D.  
Stanford University, 1953

The problem motivating this study was to determine the optimum supervisory load for college supervisors of student teachers. Pertinent sub-problems were: (1) What activities performed by supervisors are of the most value in the preparation of the student teacher? (2) What activities do supervisors perform most frequently? (3) What is the time factor involved in the scheduling problem of the supervisor?

Data were obtained by: (1) questionnaires addressed to supervisors in California teacher education institutions, and supervisors at Colorado State College of Education; (2) personal interviews. Data relative to the period of time spent by supervisors were obtained by the analysis of three-day diaries. One hundred and one California supervisors out of 288, and 32 supervisors at Colorado State College of Education participated in the study. A total of 133 supervisors submitted questionnaire data, and 55 California supervisors were interviewed.

Subsidiary problems answered are: (1) What is the median number of student teachers supervised per supervisor? (2) What per cent of the supervisor's total load is supervision? (3) How much of

the supervisor's time is spent in travel? (4) What is the median distance traveled by supervisors to visit cooperating schools? (5) How much time is spent by supervisors in visitations with student teachers? (6) How many hours per week does the supervisor teach college classes? (7) How many supervisors engage in research?

Responses to 54 supervisory activities were analyzed according to each of three criteria: value, performance frequency, and time consumption. Activities considered to be of value, performed frequently, and to be time consuming were arranged in rank order in the index of significance.

Activities reported in daily diaries were categorized as follows: conferences, preparation, classes, travel, meetings, activities related to professional advancement, observation and supervision, office, and extra-curricular activities.

Two hypotheses to determine the optimum as to the maximum number of student teachers per supervisor were suggested by the analysis of diary data. The "hypothesis of minimum time" is based on the principle that 45 hours constitute a full load per week per supervisor. The average number of minutes spent by California supervisors to supervise one student teacher is 147.8. The maximum number of student teachers that one supervisor can supervise is 18, if supervision constitutes a full load. The analysis of diary data does not strongly support the "hypothesis of minimum time." The second hypothesis (hypothesis of constants and variables) is based on the principles: (1) time spent by supervisors in certain supervisory activities is relatively constant, and is not directly related to the number of student teachers assigned to the supervisor: (2) time spent in supervisory activities related to observation and conferences with student teacher and resident teachers varies proportionally to the number of student teachers. This hypothesis is supported by the data in the study.

Diary data of 40 supervisors reveal that the "constant time" is 969 minutes per week per supervisor. The "variable time" is 71 minutes per week per student teacher. There are 2700 minutes in a 45-hour week.  $(2700 - 969 = 1731 \text{ minutes. } \frac{1731}{71} = 24.6 \text{ student teachers})$ . According to the "hypothesis of constants and variables" supervisors receiving three-fourths supervisory load credit may supervise 14.8 student teachers, and supervisors receiving half-load credit may supervise 5.4 student teachers. There is no provision for a one fourth-load of student teacher supervision.

The "hypothesis of constants and variables" will serve as a useful basis for experimental verification. Supervisory loads should be established on this basis. Careful records to establish the relationship of time spent in supervisory activities to the quality of supervision, control situations with heavier and lighter loads, and careful evaluation of results on a comparative basis are required for this purpose.

Microfilm copy of complete manuscript of 724 pages, \$9.05. Enlargements 6" x 8", 10¢ per page. Library of Congress card number MicA54-434.

**AN IN-SERVICE EDUCATION PROGRAM FOR  
TEACHERS OF INDUSTRIAL ARTS IN NEW YORK  
STATE: A STUDY OF THE IN-SERVICE  
EDUCATION NEEDS OF THE INDUSTRIAL ARTS  
TEACHERS OF NEW YORK STATE AND  
SUGGESTED WAYS OF MEETING THESE NEEDS**

(Publication No. 7132)

James Robert Hastings, Ed. D.  
New York University, 1953

The purpose of this study was to identify needs for in-service education of industrial arts teachers in the State of New York and to make recommendations for meeting these needs through programs involving the services of such existing agencies as the public and private teacher training institutions of the State and the State Education Department.

A study of teacher needs for in-service education is of value in New York State because the preparation of industrial arts teachers has been so varied over the years. Certification requirements have been increased for industrial arts teachers in the State from two years to four years, with permanent certification granted upon completion of 30 semester hours of graduate study.

From a review of related literature and research it is shown that industrial arts teachers in service during the past two decades have been faced with the twofold problem of (1) the modification and expansion of his concepts and understanding of the basic educational philosophy within which he was working, and (2) the problem of keeping pace with a rapidly changing and ever more complex industrial society which he is supposed to interpret to his students.

Normative survey type research was used to gather data pertaining to: (1) the status of professional preparation and experience of industrial arts teachers; (2) opportunities industrial arts teachers have for professional growth and development in New York State; (3) nature of the in-service needs for professional growth and development; (4) types of courses and services industrial arts teachers consider to be most helpful in meeting their needs for professional growth. The survey included a total of 1298 industrial arts teachers, 42 supervisors, and 50 high school principals having industrial arts teachers under their supervision.

The data obtained were treated in narrative and tabular form according to the teaching levels of the teachers and also by areas of the State. For studying teachers' in-service needs and suggested means of meeting those needs, the data were arranged according to the six service areas of New York State. A comparison of needs identified by teachers themselves was made with needs which supervisors and principals identified for industrial arts teachers in all areas.

From the findings, implications were noted and recommendations for improving the in-service education opportunities of industrial arts teachers of New York State stemmed from these. A general conclusion which may be drawn from the study as a whole is that the industrial arts teachers have been active professionally in their in-service growth. The study also revealed that teachers have access to some well developed institutional programs of on-campus study but there seems to be considerable need for these institutions to increase off-campus programs and field services for the industrial arts teachers.

Recommendations are made for an improved program of in-service education utilizing existing agencies within the State such as local industrial arts supervisors, teacher training institutions and the State Education Department.

The recommendations made cover guiding principles for administering an in-service program; in-service activities of both credit and non-credit variety, special research and information services, and the personnel and administration procedures for carrying out an effective statewide program.

Suggestions are made for providing courses, services and activities which will meet the general professional and technical needs of the teachers by a cooperative effort of all agencies. The establishment of in-service training centers in service areas of the State is seen as one means of facilitating professional growth of teachers.

Improved in-service education opportunities for teachers of industrial arts should result in better education for the children of New York State.

Microfilm copy of complete manuscript of 214 pages, \$2.68. Enlargements 6" x 8", 10¢ per page. Library of Congress card number MicA54-435.

**COMPETENCES OF THE HOMEMAKING  
TEACHER IN THE SECONDARY  
SCHOOLS OF CALIFORNIA**

(Publication No. 6877)

Gertrude Hannah Luehning, Ed.D.  
Stanford University, 1953

The immediate purposes of this study of competences of the homemaking teacher in the secondary schools of California were (1) to determine or isolate competences critical to homemaking teachers and (2) to design an instrument to discern the degree to which a given teacher possessed those competences. In addition four ultimate purposes were:

1. To assist in arriving at a more nearly objective evaluation of homemaking teachers as a basis for selection or subsequent promotion.
2. To aid in appraising those areas in which further strength is needed through additional training.
3. To make possible a comparison of homemaking teachers, taking into consideration the differences between situations in different school systems.



4. To assist in establishing standards for homemaking teachers and programs of an individual school, a school system, and teacher-preparing institutions.

Isolating the factors critical to the homemaking teacher was achieved largely through opinions obtained by interviews and re-interviews with approximately sixty leaders in the field of homemaking education, as well as principals, in all levels of the school system. From their responses, twenty-two traits were deemed to be objective, valid, comprehensive, and to have bearing on the issue. In order to conform to the criteria, it was necessary to rule out personality factors, which while persistent in mention, have been shown to be less discriminating of teacher ability.

An instrument composed of five parts – the competence scales, manual of instructions, anecdotal behavior report sheets, ratings recording sheet, and rater's criticism sheet – was designed. Critical to the effectiveness of the rating device was the specification that the raters must record anecdotal behavior upon which the specific point rating was accorded.

With this instrument, a pair of experts in homemaking education each observed and rated the same ten homemaking teacher-subjects. Observations, interviews, and recording behavioral incidents required an average of fifteen hours per subject.

A further test of the instrument was obtained by having two pairs of raters read and rate unidentified, factual, descriptive, two thousand-word reports of each of the ten teacher-subjects – reports which were based on twenty sources of information. The pair of observation-interview raters read the descriptions five months after conducting the direct observations; the second pair of raters read the descriptions twice, one month apart.

High correlation coefficients indicate the reliability, objectivity, and validity of the instrument. Minimum correlations for the totals of the four section averages were .94 for observation-interviews, and .88 for description ratings. All correlation coefficients reached the .01 level of significance.

Additional evidence that the rating device effectively differentiates among levels of teaching ability was obtained from responses of eighteen homemaking specialists throughout the state who reported ratings on a total of forty-nine teachers of their choosing.

While appraisal of the instrument was with a relatively small sample, statistical and informal findings warrant the following conclusions: that the two immediate purposes of this study have been served – (1) the competences critical to homemaking teachers were isolated, and (2) the instrument designed thereon did differentiate among levels of teaching ability. Moreover, there is indication that the four ultimate purposes of the study can be met. The ultimate decision on the effectiveness of the instrument, however, depends upon the findings from further and wider use of the device.

Evidence to date is sufficient to warrant the initial position that this instrument requires expertness in homemaking education, skill and acumen in observing and interviewing, and a reported average of fifteen hours per rating. Since administrative per-

sonnel form judgments of homemaking teachers which are of consequence to teachers, students, the homemaking program, the school, and the community, a device which directs their attention to discriminating factors, as does this instrument, merits favorable consideration.

Microfilm copy of complete manuscript of 278 pages, \$3.48. Enlargements 6" x 8", 10¢ per page. Library of Congress card number MicA54-436.

## THE PREPARATION OF TEACHERS FOR MEMBERSHIP IN THE PROFESSION

(Publication No. 6878)

Elliott Bolte MacCracken, Ed.D.  
Stanford University, 1953

The purpose of this study was to define the role and the needed competences of the teacher as a member of the profession, and to explore classroom plans for providing these competences.

Three major premises guided its development: (1) an important part of the responsibility of the teacher is carried through as a member of the organized profession, (2) the teacher need be prepared for this role, and (3) the teacher-education institution carries responsibility for providing the individual with these competences.

The study was developed through three major parts: (1) an analysis and survey of present and potential services of professional organizations, (2) a formulation of an operational definition for the good teacher as "A Member of the Profession" as a revision for the California Statement of Teaching Competence,<sup>1</sup> and (3) development of exploratory preservice experiences toward providing these competences.

The initial survey investigated the idea of the profession as a means of occupational organization, and compared education, law, and medicine as organized professions. Education was found established in a fairly firm position as the largest profession, and active in a wide field of operation to pursue its general objectives of improving education and advancing the profession of teaching. Response to an inquiry of leaders in professional standards endorsed these activities and particularly showed three important characteristics: (1) to a large extent the teaching profession progresses through joint operation with other groups interested in education, (2) it is of crucial importance for the profession to furnish leadership in initiating and carrying through the activities to achieve its goals, and (3) the present situation demands and furnishes opportunity for greater accomplishment.

Professional responsibility was defined as a dual role: (1) the teacher as an individual affecting group policy, and (2) as a member of the professional group and representing it.

In collaboration with the California Teachers Association and the National Commission on Teacher

Education and Professional Standards, a study group was set up which revised category "6. A Member of the Profession" of the California Statement of Teaching Competence. This revision, thirty items, was organized with the major headings shown below:

- 6.32 Works effectively in the activities of the organization
- 6.321 Works within the organization through democratic processes
- 6.322 Secures public cooperation and understanding in audience situations
- 6.323 Maintains working relationship with lay groups and individuals
- 6.324 Recognizes and identifies sources of community concern on school problems
- 6.325 Contributes to the development of an effective organization.

Two concomitant factors of importance were delineated: (1) knowledge and understanding of the organized profession, and (2) favorable attitude toward the purposes of the profession.

In the third part of the study exploratory preservice classroom experiences were developed to provide the above mentioned skill, understanding and attitude. These were applied in teacher-preparatory programs of Southern Oregon College of Education and Stanford University. They were planned to utilize a combination of individual and group activities to study problems met by the teacher. Students and instructors participated in evaluation: the plan was judged practical. Guidelines were set up for future development of this program.

<sup>1</sup> L. B. Kinney, *Measure of a Good Teacher*, San Francisco, California Teachers Association, 1952.

Microfilm copy of complete manuscript of 272 pages, \$3.40. Enlargements 6" x 8", 10¢ per page. Library of Congress card number MicA54-437.

#### THE EFFECTIVENESS OF ROLE-PLAYING-DISCUSSION IN TEACHER TRAINING

(Publication No. 7109)

Miriam Myrtle Reinhart, Ph. D.  
New York University, 1953

This investigation studies the effects of role-playing combined with discussion upon attitudes and discussion behavior of teachers-in-training. The study was designed to answer: Would the students in eight classes in which three role-playing-discussion experiences were introduced as part of an ongoing educational program, make significantly greater gains in the quantity and quality of their verbal contributions to discussions, and in their change of attitude at the close of the experiment, than would the students in four comparison classes in which the role-playing-discussion had not been introduced?

Kelly and Perkins' attitude test, "How I Teach" was used to measure the change in and retention of attitudes. The findings favored, though not significantly, the experimental sections. The attitude measure was not considered completely adequate to its task because of the fluidity of the role-playing-discussion method and the limitations in time. It was concluded that this does not necessarily mean that there was no attitude change for it was probable that attitudes were in flux.

Quantity and distribution of verbal contributions to discussions were measured by a revised form of Meil's vocalization chart. The experimental sections showed a significant increase in discussion time consumed by students, but failed to show significant gains in the number of students participating and the extent to which (a) discussion time and (b) discussion comments were equally distributed among students. The increase in discussion time consumed by students was interpreted to mean that students were more likely involved in what was going on and were likely revealing more of themselves during the discussions.

The third measurement was change in quality of verbal contributions to discussions. Early in the study it was hypothesized that interacting and complementary factors making up the content of most problem-solving discussions could be described in general terms. Identifying these factors would enable one to compare problem-solving discussions. Electrical transcriptions of the discussions were studied to develop a form for this purpose. The resulting form was applied to the data to learn if changes which seemed to take place actually had taken place. Highly significant changes favored experimental sections in the extent to which comments (a) were concrete and real, (b) expressed "feelings" as well as "information", and (c) integrated information with interpretation. The changes in quality of discussion participation overwhelmingly favored experimental classes for both students and teachers.

The study gave reason to believe that: (1) role-playing-discussion tends to evoke class discussions that more nearly approach a problem-solving level, and (2) students tend to share in curricular responsibilities in preparation for and during class sessions. Apparently diversity of teacher qualifications and subject offerings did not influence the outcomes.

Implications arising from the study are that role-playing-discussion used in the teacher-training setting (1) helps bridge the gap now existing between precepts taught and methods practiced by instructors of teachers-in-training; (2) helps promote identification with and interpenetration of thoughts and feelings of classmates; (3) promotes mental health insofar as accuracy of both spacial and temporal perceptions of society are increased; (4) evokes a more nearly accurate perception of self as well as of others; and (5) promotes the acceptance of social responsibility.

The action-research method seemed to contribute to the relative success of the experiment in that it involved students, teachers, and investigator in a sharing process.



Microfilm copy of complete manuscript of 278 pages, \$3.48. Enlargements 6" x 8", 10¢ per page. Library of Congress card number MicA54-438.

### THE HOMEMAKING PROGRAM FOR BEGINNING TEACHERS

(Publication No. 6884)

Gertrude Isabel Roskie, Ed. D.  
Stanford University, 1953

Several studies have shown that home economics teachers normally carry a number and variety of responsibilities so great that it is doubtful whether they can conduct their total program effectively and with satisfaction. In general it can be expected that an experienced teacher will be better able to handle multiple responsibilities than a beginner, but approximately twenty per cent of the homemaking teachers in the Pacific Region were beginners in 1952-53. In view of these circumstances it would seem desirable to attempt to establish a program that would be appropriate for beginning teachers as differentiated from the program that is expected of experienced teachers. If such programs could be established, then pre-service and in-service education could be specifically pointed toward preparation for the differentiated responsibilities. This study was designed to establish such a program, test it in practice, and draw implications for teacher education in home economics.

Responses from 516 persons concerned with the high school homemaking program in the Pacific Region (secondary school administrators, parents, homemaking supervisors, teacher trainers, teachers and students) were used to outline desirable high school programs for beginning and experienced homemaking teachers. Fourteen inexperienced homemaking teachers in Montana carried the desirable program for beginning teachers with success in the majority of its phases.

The phases in which these beginning teachers were not successful were those that involved an understanding of social and economic problems in communities, working cooperatively with parents in homes, and helping to extend the homemaking program to elementary pupils, boys and adults. The chief reason given for lack of success in these phases of the program was insufficient time. A large amount of these young teachers' time was spent in preparation and with student activities unrelated to homemaking.

To be able to carry these total school and community phases of the homemaking program these young teachers need experience on the job. They need the type of administrative arrangements that will facilitate their work, and encouragement from their administrators. They also need a strengthened background of preparation which will provide: experiences in working with families in homes and with community groups; observation, participation and student teaching in homemaking that will include work in elementary grades, interdepartmental ex-

periences in the secondary schools, experiences with programs for boys and for adults; and more functional experiences in sociology and economics as they relate to family life in the community.

Results in this study indicate that continuous experimental attack needs to be made on the problems of program planning, for high school homemaking, at state and local levels, and that teacher education institutions need to determine experimentally what experiences on the pre-service and in-service levels best fit their trainees to carry the program considered desirable for the high schools of their states. Responses to a group of the characteristics of high school homemaking programs on the original instrument, which are commonly considered desirable by leaders in the field, proved to be invalid or not significant. Further study needs to be done to determine whether these are features that should be considered for inclusion in local homemaking programs.

This study determined what 516 persons concerned with the high school homemaking program in the Pacific Region considered a desirable program. It differentiated those characteristics considered desirable for experienced and beginning teachers. It summarized the evaluation of the attempt of fourteen beginning teachers in Montana to carry the program considered desirable for beginning teachers, and it has drawn implications for pre-service and in-service teacher education.

Microfilm copy of complete manuscript of 159 pages, \$1.99. Enlargements 6" x 8", 10¢ per page. Library of Congress card number MicA54-439.

### DEVELOPMENT OF PRINCIPLES FOR IN-SERVICE IMPROVEMENT OF TEACHERS IN THE PHILIPPINES, WITH SPECIAL REFERENCE TO SULU PROVINCE

(Publication No. 6992)

Maximiniano Aspiras Velasquez, Ed. D.  
University of Illinois, 1953

#### Purposes

(1) To develop and set forth guiding principles for the in-service education of public school teachers in the Philippines, with special reference to Sulu Province; and (2) to suggest ways of implementing the principles at the various levels of the Philippine educational system.

#### Method

The author reviewed the current literature on the in-service education of teachers and collected several statements of principles as expounded by different educational leaders. Out of this array of principles, he formulated a set of preliminary statements which he presented, for validation, to a jury of American experts and Philippine educators.

#### Findings and Interpretations

The returns from the American experts and the

Philippine respondents showed that, except in a few statements, there was general agreement between both respondents. The sixty-five statements, as finally restated, are listed below in abbreviated form.

## I. COOPERATIVE AND DEMOCRATIC PLANNING

### A. Formulating and Determining Policies.

1. Policies for the in-service program should be cooperatively and democratically formulated by all who are concerned with and affected by such policies.

2. The participants in policy-making and planning should assume the responsibility of supporting the policies and doing all they can to implement them.

3. Policies and plans should be broad, leaving the details to the teachers.

### B. Determining Objectives, Purposes, and Goals.

4. The basic foundation for an effective in-service program is common agreement on objectives, purposes and goals.

5. Objectives should serve as guides to determine the progress, or the lack of progress, of the program.

6. The in-service program is a process of enrichment and deepening of understanding which begins in the pre-service period.

7. The program should be directed toward the improvement of teachers as persons, as citizens, and as worthy members of the teaching profession.

8. The program should provide experiences in working with others and participating in democratic group processes.

9. The ultimate purpose of maintaining in-service programs is to improve the overall learning situation for boys and girls as well as for adults.

### C. Identifying Problems and Needs.

10. The program should emerge from a felt need determined cooperatively.

11. The program should include both individual and group problems.

12. The pattern of any particular program should vary in accordance with the particular needs of the situation.

13. Two-way channels of communication to insure the free flow of ideas and suggestions should be opened and maintained.

## II. ADMINISTERING THE PROGRAM

### A. Organizing the Program.

14. The process of organizing and administering the program should be a joint responsibility of all who are concerned.

15. The program should be flexible to allow individual and group differences; it should include a variety of activities.

16. Underlying the administration of the program should be a genuine belief on the part of administrators and supervisors in the improvability of people.

17. The program should, depending upon the local leadership and resources available, primarily be the responsibility of the local school community.

18. If the program is to succeed, it should have an effective machinery of action and strong

administrative support.

19. The program should start its activities with those problems on which the participants can do something and proceed progressively to more difficult tasks.

### B. Stimulating In-Service Growth Through Personnel Policies.

20. Harmonious relationships among staff members constitute major incentives for engendering interest in professional growth.

21. Genuine motives for professional growth come from within the individual; therefore, participation in the program should generally be voluntary.

22. The program should have provision for some kind of tangible reward for outstanding in-service efforts.

23. The administrators and supervisors should capitalize on the skill and enthusiasm of those teachers who show potential leadership.

24. The program should have provision for encouraging teachers to publish educational articles.

25. The program should include provision for study toward completion of teacher education curriculum or an advanced degree.

26. The administration should help create a physical, social, and psychological "climate" conducive to in-service growth.

27. The administration should, in so far as it is feasible and consistent with local conditions, release teachers from the traditional and undemocratic administration and supervision

28. Teachers should, within the regulations established by legal action, be given a voice in determining contractual relationships and tenure.

29. Teachers are stimulated to grow in service when they have some assurance of security in old age.

30. Teachers' professional organizations help foster in-service growth through stimulation of common professional interests and common goals.

31. Teachers and administrators should develop, adopt, and enforce their code of ethics.

### C. Providing Time, Facilities, and Funds.

32. The in-service program should be recognized as an integral part of the whole educational program.

33. The school system should provide appropriate materials and facilities for use of the participants in the in-service program.

34. Appropriate media for acquainting and familiarizing teachers with current educational innovations should be provided by the school system, the teacher-training institutions, and other agencies concerned.

35. The program should be supported primarily by the school and the community.

36. The participants in the program should assume the responsibility for collecting, preparing, and distributing teaching aids and materials.

### D. Identifying and Utilizing Local Resources.

37. Every effort should be made to identify and utilize community resources.

38. The services of resource persons should be utilized whenever appropriate and available.



39. Teachers should familiarize themselves with and utilize resources available in the school plant and its immediate vicinity.

40. Resources at the various levels should be selected in terms of what teachers intend to accomplish at any given time and situation.

### III. AREAS OF PROFESSIONAL GROWTH

#### A. Understanding Children.

41. The program should enhance teachers' ability in guiding children and adults in all aspects of their development - mental, physical, social, and cultural.

42. The program should improve teachers' ability to identify what a child knows, how he feels, and how he learns.

#### B. Understanding of and Working with the Community.

43. The program should include participating in and working with the community in worthwhile activities.

44. The program should include provision for informing the public of the nature and value of the in-service activities, and for seeking public cooperation, support, and understanding.

#### C. Utilizing New Developments in Education.

45. The program should make the participants alert and sensitive to the latest developments in education.

46. The program should include, when appropriate, provision for research, studies, and experimentation.

#### D. Applying Principles and Laws of Learning.

47. The program should be administered in a manner consistent with the best knowledge of how teachers [adults] learn, considering their different backgrounds and achievement levels; giving such allowance for individual differences as teachers are expected to give boys and girls.

48. Teachers grow as a result of what they are able to do, by, and for themselves and not what is done on them, or for them.

49. Teacher growth is facilitated when learning experiences are accompanied by satisfaction and when knowledge of progress is known.

50. The program should be concerned, in the main, with known principles and laws of learnings.

#### E. Training for Leadership.

51. Leadership in the in-service program should be a function, not a person.

52. The program should extend the teachers' self-reliance and develop their willingness to assume and execute responsibility.

#### F. Improving the Curriculum.

53. The in-service program should result in the improvement of the curriculum.

### IV. EVALUATING THE IN-SERVICE PROGRAM

54. The program should have provision for its continuous evaluation by all concerned.

55. The program should result, on the part of the public, in a higher regard for teachers and a better understanding of the teaching profession.

56. The evaluation of the program should take

into account the well-rounded development of teachers and pupils, and the promotion of better parent-teacher and teacher-pupil relationships.

57. A program of action should follow evaluation.

58. Evaluation and objectives in in-service education, as in other education, should be interrelated.

59. The evaluation should not reduce the participants' feeling of security and self-confidence but should increase it.

60. Good evaluation should be concerned primarily with "what values" resulted from the overall effect of the in-service activities.

### V. NEW PRINCIPLES ADDED ON BASIS OF JURY RESPONSES

61. There should be close cooperation between the institutions which prepare teachers and the schools which employ them.

62. The program should develop group and individual morale among the teachers.

63. The program should have provision for the protection and improvement of the physical and mental health of the teachers.

64. The program should maintain a balance between specific help and discussion of general principles, and it should bridge the gap between theory and practice.

65. Supervision, when used as a means of in-service education, should be democratic and constructive.

### Recommendations and Proposals

The author made general proposals and recommendations for translating the above principles into action at the various levels of the Philippine educational system. Since teachers in various schools have different in-service growth needs, he avoided describing a blueprint of an "ideal" and logically complete program. He mentioned some of the obstacles to be overcome before full implementation of the principles can be done. Conversely, he enumerated some of the assets found in the schools, in the teachers, and in the community which are favorable to the implementation of the principles he developed in this study.

Microfilm copy of complete manuscript of 315 pages, \$3.94. Enlargements 6" x 8", 10¢ per page. Library of Congress card number MicA54-440.

## EDUCATION, THEORY AND PRACTICE

A READING READINESS AND PREPRIMER  
MANUAL FOR THE TEACHING OF BEGINNING  
READING IN THE URBAN PRIMARY SCHOOLS  
OF ECUADOR, SOUTH AMERICA

(Publication No. 7123)

Beatrice P. Ablen, Ed. D.  
New York University, 1953

The writing of this study is an outgrowth of the candidate's experience in Ecuador during the school year 1948-49. Under the auspices of the Education Division of the Institute of Inter-American Affairs, and the National Ministry of Education in Ecuador, she worked with educators from the United States and from Ecuador to revise the primary curriculum in Ecuador's urban primary public schools.

The purpose of this study is to bring to the first-grade teachers in the urban primary schools of Ecuador, South America, a knowledge of improved classroom practices in the teaching of beginning reading based upon the findings and implications of reading research in the United States, 1930-1951, through the writing of a reading readiness and preprimer manual for the teaching of beginning reading.

The manual is divided into three parts. In the first part the candidate describes in simple non-technical language a variety of factors that contribute to reading readiness so that all the first-grade teachers in the urban primary schools of Ecuador may better understand their implications for the teaching of beginning reading. Only those factors upon which there seems to be general scientific agreement are discussed.

In part two the candidate has worked out a planned readiness program for the first-grade in order to acquaint the teachers of Ecuador with classroom practices that will enable them to observe and develop in their first-grade pupils a number of factors contributing to readiness for successful instruction in beginning reading. The teachers are given detailed descriptions of activities suitable for a first-grade and are advised concerning a daily schedule that will allow time for these activities. Many types of experiential reading are suggested and an emphasis is placed upon the importance of developing an initial sight vocabulary through reading experiences that are geared to the children's own interests.

Part three guides the teachers in the instruction of reading from the preprimer *Lola, Ines y Pepe*.<sup>\*</sup> The teacher's preparation for each lesson, her procedure in introducing the preprimer stories to the children and the independent related activities given to the group as a follow-up of each lesson are demonstrated step by step. This part of the manual accents the fact that in the formation of reading groups much attention must still be paid to individual stages of readiness within each group and that all grouping should be kept very flexible in order that changes from one group to another might be made as a matter of course without undue stress.

Throughout the manual the teachers are helped to see that learning to read is dependent upon the indi-

vidual child's readiness for the experience, that children in a first-grade should not be expected to achieve readiness for reading from books at one and the same time, and, that teachers of beginning reading have as their most important task the recognition of and the provision for the individual differences within their classes.

This manual will be an important contribution to Ecuador's effort to reorganize her public primary education in order that it might conform to modern methods. Although practical demonstrations of modern methods in teaching are now going on in urban experimental schools, progress is slow due to two significant causes. The first is the serious lack of teaching materials suited to modern methods, and the other is the limited number of teachers trained in using modern teaching materials.

<sup>\*</sup>Lola, Ines y Pepe is the first in a series of three preprimers written by two Ecuadorean educators, Julia Bazante and Luis Eduardo Soria. The candidate worked with these educators during her stay in Ecuador and was instrumental in getting them to write the stories for the preprimers.

Microfilm copy of complete manuscript of 191 pages, \$2.39. Enlargements 6" x 8", 10¢ per page. Library of Congress card number MicA54-441.

JUNIOR HIGH SCHOOL AND  
NON JUNIOR HIGH SCHOOL ACHIEVEMENT

(Publication No. 7146)

Russell Ingram Damon, Ed. D.  
Bradley University, 1953

This is a comparative study of achievement in the seventh grade in certain subject matter areas, personality adjustment, and attitudes in two junior high schools and in several non junior high schools in the same city school system. Specifically, it is an investigation to determine the effect on achievement of two approaches to the curriculum, the large time block approach and the subject matter approach, as evidenced in the offerings of the two types of schools under consideration.

Previous research in this field was fifteen to twenty years old and concerned, mainly, with evaluation of subject matter achievement. It was desired to determine the present status of achievement and to evaluate some of the less tangible results of education. In an effort to increase the reliability of the data careful attention was given to the comparability of the groups of pupils and the control of the principal variable.

The general socio-economic background of the pupils, their mental ability, and the equality of educational opportunity were given careful consideration in selecting the group samples. In spite of this attention there were significant differences in the mean intelligence quotients, the socio-economic status, and the mean achievement scores by groups at the first testing.



In October the reading scores did not indicate any superiority for either the junior high or the non junior high school pupils. The non junior high school pupils were significantly superior in arithmetic, language, total achievement, history, and adjustment as measured by the tests of the study. In attitude, as indicated by the test "Belief About School Life," the junior high school pupils were slightly more democratic.

The mean raw scores in May, although somewhat lower, showed the superiority for the non junior high school group. The differences in the mean, the critical ratios, and the gains in achievement indicated consistent superiority in growth in favor of the junior high school groups. The adjustment and the democratic attitude of the junior high school pupils were superior to the students under the subject matter curriculum of the eight year schools.

Because of the significant difference in the mean of the intelligence quotients, the scores on the socio-economic status test, and the higher initial achievement scores, 105 pairs of junior and non junior high school pupils were matched on the basis of intelligence quotients and socio-economic background to secure more comparable groups and more reliable data. Further analysis of the data indicated that the differences in achievement favored the non junior high school members of the matched pairs. The differences in achievement were smaller, the critical ratios indicated lower level of confidence, and the differences in gain in favor of the junior high school members of the matched pairs strengthened the previous conclusion that they were making greater gains in achievement than were the non junior high school pupils as measured by the tests of the study in this particular city.

Based upon the comparison of the three groups of pupils and the matched pairs of pupils the following conclusions were reached:

1. The achievement of junior high school pupils is slightly superior to that of non junior high school pupils, particularly in the language arts and social studies fields, as measured by the test instruments of the study, with this particular sample of pupils.
2. There is little difference in the average self, social, or total adjustment scores of the pupils in the seventh grade. A slight trend was noted toward improvement in adjustment between testing periods in favor of the junior high school pupils.
3. In "democratic attitude" the junior high school pupils seemed to grow more democratic and more confident as measured by the test "Belief About School Life."
4. The large time block approach to the curriculum was superior in the area of the language arts and social studies, and the achievement in arithmetic, generally taught outside of the large time block, was equal to that of the pupils taught under the subject matter approach to the curriculum.

This study indicated that more research in this area over longer periods of time and with improved instruments was needed.

Microfilm copy of complete manuscript of 252 pages, \$3.15. Enlargements 6" x 8", 10¢ per page. Library of Congress card number MicA54-442.

## THE CULTURE CONCEPT IN THE TEACHING OF HISTORY

(Publication No. 6939)

Shirley H. Engle, Ed.D.  
University of Illinois, 1953

### The Problem

This study is concerned with exploring the relationship between the growing body of knowledge about human culture and the teaching of history in the schools. The culture phenomenon was examined to determine its usefulness in suggesting principles for selecting and organizing historical content for purposes of instruction.

### The Method of Investigation

The procedure used in this study was one of surveying, analyzing, and evaluating all available literature having any relationship to the problem in hand. After a survey of what is presently known about the process of human cultural development, the following elements in the problem were studied: (1) the relation of the culture phenomenon to the modification of our ideas of historical knowledge and historical scholarship, (2) the relation of the culture phenomenon to our ideas of what it means to teach history, (3) the relation of the culture phenomenon to some of the presuppositions which are commonly used in the study of history, (4) the identification of laws of culture which may guide a proper study of history, and (5) the formulation of principles for the organization of history teaching in the light of the culture phenomenon.

### Conclusions

Explicit statement and analysis of the theories commonly used in explaining human events reveal their inadequacy when an effort is made to move from one culture or from one cultural state to another. Thus, historical scholarship has been hard pressed to arrive at any final and dependable explanation of human events. The search for the universals in human history is now coming to focus on the process of cultural development. Despite its diverse manifestations from human society to human society, the culture process based on a common though protean biological inheritance demonstrates a pattern of human values and institutions common to all cultures and to all times. Rough classification of the elements in the culture process is now possible to psychological, anthropological, and biological scholarship. On the basis of such a classification more dependable appraisals of human behavior and societal development are possible. A most promising next step in historical study seems to lie, therefore, in a closer focus upon the whole pattern of life in a

particular society from the perspective afforded by the concept of the culture process.

The alternatives in history teaching include the presentation of a chronicle or saga of the society with the purpose of bringing about the unquestioning personal identification of youth with the traditions and rationalizations of their culture while being unaware of the culture process. Or history teaching may make the culture process an explicit datum and frame of reference in the study. In this case the study of history has the potential of gaining for the student some measure of objectivity with respect to his own and other cultures and with it the capacity for critical analysis and interpretation of human institutions in the light of common human values and to the end of reasoned improvement in living.

The culture phenomenon suggests certain more productive ways to organize history teaching including: (1) the contributory consideration of man as a physical and cultural organism, (2) the study of the broad sweep and direction of history in terms of cultural entities and cultural processes, (3) the greater use of local communities and of somewhat discrete cultural epochs as focal points around which to organize more intensive historical investigation, and (4) the focalization of history teaching upon the study of current social problems.

Microfilm copy of complete manuscript of 208 pages, \$2.60. Enlargements 6" x 8", 10¢ per page. Library of Congress card number MicA54-443.

#### PROBLEMS IN WRITING IN COLLEGE COMPOSITION CLASSES

(Publication No. 6868)

Alvin Leon Fellers, Ed. D.  
Stanford University, 1953

This dissertation presents the identification and analysis of the writing problems found in 493 themes written by eighty students the spring semester of the senior year in fifteen sections of English in four high schools and 580 compositions written by the same students as freshmen during the fall term in fifty-one composition classes in three colleges. Additional pertinent evidence was obtained from observing the classes of five of the seven high-school teachers and those of twenty of the thirty-four college instructors, from a series of conferences with the high-school teachers of senior English and thirty-four instructors of college composition cooperating with the study, and from an attitude questionnaire returned by 82 per cent of the students upon completion of their first term of college composition.

The problem of the study was divided into the following four sub-problems: (1) What were the problems in writing that students had in college composition classes? (2) Did a term of college instruction eliminate the errors found in the writings of the students as high-school seniors? (3) What were the similarities and differences between the methods of

teaching in senior English classes in high school and the methods of teaching in college composition classes? (4) What were the attitudes of the students toward the methods of instruction on both levels?

The study presents the following findings:

1. The problems in writing in college composition classes were divided into the following Problem Areas:

- I. Content, Organization, and Presentation
- II. Grammar
- III. Punctuation
- IV. Capitalization
- V. Spelling
- VI. Diction

The major difficulties in each Problem Area were as follows:

- I. Content, Organization, and Presentation
  - a. use of irrelevant material
  - b. lack of specific detail
  - c. lack of evidence of reflective thinking
  - d. faulty paragraphing
  - e. ineffective introductions and conclusions
  - f. ineffective expression of ideas
  - g. use of trite, colloquial, and slang expressions
- II. Grammar
  - a. disagreement between subject and predicate
  - b. disagreement of pronoun and its antecedent
  - c. dangling modifiers
  - d. fragments
  - e. split infinitives
  - f. confusing adjectives and adverbs
- III. Punctuation
  - a. faulty use of the comma in:
    - 1) introductory adverbial clauses
    - 2) independent clauses of a compound sentence with a coordinating conjunction
    - 3) restrictive and non-restrictive modifiers
    - 4) words, phrases, and clauses in a series
  - b. lack of the apostrophe in the possessive case
  - c. lack of the hyphen in compound words
  - d. unnecessary punctuation
- IV. Capitalization
  - a. capitalizing common nouns and adjectives
  - b. capitalizing all the words in titles of books, compositions, and articles
- V. Spelling
 

About 92 per cent of the themes written in high school and 69 per cent of those written in college contained misspelled words.
- VI. Diction
 

Students had difficulty in determining when to use "folksy" diction and when to use more formal expression.

2. A term of college composition did not eliminate the errors found in the writing of the students as high-school seniors. Tables in the study show that errors persist throughout the term of instruction. In some instances, those at the end of the term were as serious as those at the beginning of the term.



3. Except for the "cram sessions" for the Subject A examination, the high-school senior English classes were devoted largely to a study of literature, whereas most college composition classes stressed writing. Other differences included: the nature and extent of theme assignments, selecting theme topics, the number of themes, and reading and grading themes.

4. The results of the attitude questionnaire showed that: (1) 70 per cent of the students believed that their high-school English class was worthwhile and that they profited from the methods of teaching, (2) those who failed the English placement examination preferred the college methods of instruction to those used in high school, (3) students who passed the Subject A believed that their high-school senior English teacher helped them through the test, and (4) the students believed that their teachers influenced the students' attitude toward English.

Microfilm copy of complete manuscript of 365 pages, \$4.56. Enlargements 6" x 8", 10¢ per page. Library of Congress card number MicA54-444.

#### READING INSTRUCTION FOR GIFTED CHILDREN IN THE ELEMENTARY GRADES

(Publication No. 7045)

Eugene Woods Klemm, Ph. D.  
Northwestern University, 1953

The purpose of this study was to investigate some phases of the scope, methods, and materials of reading instruction for gifted children in the elementary grades.

Information was obtained through questionnaires and through visits and conferences with educators in schools which have programs for the gifted.

The General Information Questionnaire was mailed to school administrators in seventy-three cities. Replies were received from sixty-five cities. Information obtained in this manner indicated that there are organized programs for the instruction of gifted children in forty-one of these school systems.

In thirty-five systems programs of enrichment are provided within the regular classes; special classes are provided in thirteen cities; and facilities for acceleration in fifteen cities. Several systems have more than one type of provision for the gifted.

Psychological tests are used for purposes of identification of the gifted in forty cities, and the recommendations of teachers in thirty-eight. Measures of physical and social maturity, records of academic achievement, and reports from parents are considered less frequently.

The Questionnaire on Reading Instruction for the Gifted was sent to the school administrators and also to staff members named by them as competent to describe the reading programs for the gifted. Data were obtained from sixty educators in thirty-seven cities, and are summarized below:

1. Reading instruction for gifted children is provided at all elementary grade levels in twenty-eight

cities; but only at certain grade levels in nine cities.

2. Reading consultants or supervisors are available to assist classroom teachers in twenty-three cities. In ten cities no such assistance is provided for the teachers.

3. Reading abilities of gifted children are most frequently measured on standardized reading or achievement tests which are usually administered by classroom teachers on an annual or semi-annual basis.

4. Reports indicated that scores made by gifted children on reading tests are usually from two to four years above the average scores of other children in the same grades. However, wide individual differences were noted. Some gifted children are relatively poor readers or may have problems in reading which require special help. Others go over the tops of the reading tests.

5. In thirty-four cities assistance is provided for gifted children with problems in reading. Educators reported somewhat limited use made of clinical facilities which are available in twenty-five cities.

6. In a majority of cases emphasis is placed on instructional practices embodied in a developmental reading program. Vocabulary development is fostered through study and analysis of words, and is further stimulated by first-hand experiences and through the encouragement of wide reading.

Guidance in outside reading is given by teachers and librarians often working in close cooperation with parents. Attention is given to the purposes for which children read: for information, for enjoyment and for understanding of themselves and their problems.

Importance is attached to the interest factor in reading and educators employ techniques of child-study designed to reveal predominant interests and needs of children. Teachers endeavor to provide opportunities for creative expression in many forms related to reading experiences. Children are assisted in gaining skill in evaluating their work and the work of other children. Recognition is given for worth-while performances. Children are encouraged to carry out research projects. Opportunities are provided for experiences in democratic living through classroom organizations. Wide use is made of audio-visual aids.

7. Educators pointed out needs for more and better reading materials of all kinds; for more adequate testing instruments; for moderate size classes; and for improved teacher-training facilities.

Microfilm copy of complete manuscript of 290 pages, \$3.63. Enlargements 6" x 8", 10¢ per page. Library of Congress card number MicA54-445.

AN EXPLORATION OF ELEMENTS BEARING ON  
THE INTERESTS OF A SELECTED GROUP OF  
ELEMENTARY SCHOOL CHILDREN WITH  
PARTICULAR REFERENCE TO THE LITERATURE  
OF INTEREST AND DEVELOPMENT

(Publication No. 7049)

Isabel Boyd Lewis, Ph.D.  
Northwestern University, 1953

### The Problem

The purposes of the study were (1) to review critically the literature pertaining to interest and development, and (2) with reference to the findings from this review, to explore expressed personal concern and developmental status as elements bearing on the interests of a selected group of children. The present study is the first in a proposed series of studies on children's interests and the elementary school curriculum. Consequently, a further purpose was to ascertain possible implications for the curriculum within the present findings.

The specific needs chosen for investigation were (1) to determine whether it was possible to relate expressions of interest to children's concerns about themselves, (2) to explore the possibility of assessing general developmental maturity on the basis of a few easily made measurements, and (3) to compare the estimates of maturity with the expressions of interest and concern for the purpose of discovering possible relationships.

### Methods

The study was conducted among the children in two fourth grade classrooms in a public school. The following procedures were used in collecting data:

1. The children were asked to write about two topics, What I Like About Myself and What I Don't Like About Myself.
2. Written responses were obtained to three questions concerning general, school, and out-of-school interests.
3. Data on height, weight, intelligence, and educational achievement were secured from school records and age equivalents computed. The mean of the four growth ages for each child was considered an estimate of developmental age.
4. The data on interests, concerns, and development were analyzed to ascertain group and individual patterns.
5. The three classes of data were compared to determine whether any significant relationships could be discovered.

### Findings

Among the findings from the review of the

literature were these:

1. Interests are regarded as important in learning and in self-realization, and provide clues to individuality.
2. Broad similarities of interests have been noted among children of like ages, and differences attributed to environmental opportunities, cultural expectations, and past experiences.
3. Current concepts such as that of developmental tasks promise to expedite the study of individual development within complex social settings.

The exploration of the expressed interest, concern, and developmental status of the children studied yielded the following findings with regard to patterns noted:

1. There were broad similarities in the topical interests and concerns expressed in the two groups. Play activities were predominant interests, while skills and personal attributes were of general concern. Most responses were egocentric.
2. Approximately half of the children mentioned similar topics as interests and as concerns.
3. Group differences were more marked in respect to concerns than with regard to interests.
4. No significant relationships were established between interests and developmental status. There appeared to be some correspondence between maturity and levels of expression.
5. Individual differences in specific items mentioned, consistency, and levels of expression appeared to be more marked than broad topical likenesses.

### Selected Conclusions and Recommendations

It was concluded that relationships among interests and other personality and developmental factors obtained for individuals but were not established for groups. Developmental origins could not be isolated from other sources of interests.

The techniques used were judged effective as employed in this study. A need for further studies using additional techniques of assessing interests, concerns, and developmental status was indicated.

Implications for the curriculum lay in the reaffirmation of the strength of individual differences, the importance of self-selection opportunities, and the danger of basing the curriculum upon general interests ascribed to children of any one age group or upon any other normative concepts or generalizations.

Microfilm copy of complete manuscript of 186 pages, \$2.33. Enlargements 6" x 8", 10¢ per page. Library of Congress card number MicA54-446.



## ENGINEERING

### ENGINEERING, CHEMICAL

#### THE PHOTOCHEMICAL OXIDATION OF SULFUR DIOXIDE TO SULFUR TRIOXIDE AND ITS EFFECT ON FOG FORMATION

(Publication No. 6946)

Earl Robert Gerhard, Ph.D.  
University of Illinois, 1953

Interest in air pollution has focused attention on the fog-producing properties of sunlight. Accordingly, a study was made of the rate of photochemical oxidation of dilute sulfur dioxide in air in both natural and artificial sunlight. The reaction was investigated at concentrations of 5 to 30 p.p.m. sulfur dioxide which is approximately twenty times the concentrations found in the atmosphere in industrial cities.

Sulfur dioxide was added to an air stream which had been filtered to remove gaseous and solid impurities. The concentration was determined by a continuous recording electrical conductivity meter. The reaction in natural sunlight was carried out in a 64 cubic foot box lined with Saran film, a plastic which does not adsorb sulfur dioxide. The box was covered with Plexiglas sheet which transmits most of the ultraviolet light between 2950 and 3200 Å., the region in which sulfur dioxide gas absorbs radiation. Solar radiation below 2950 Å. does not reach the surface of the earth. The reaction was also studied in artificial sunlight, in an eight-liter cylinder of Lucite with a top of Plexiglas, by use of a General Electric Type RS Sunlamp. The ultraviolet radiation from this lamp consists primarily of the 2967, 3022, and 3129 Å. mercury lines. The ultraviolet intensity of both the sunlamp and natural sunlight in the region 2950 to 3200 Å. was recorded by means of a cadmium-magnesium phototube. It was approximately five times as great in the chamber with irradiation by the sunlamp as it was in the noon time natural sunlight.

A micro-analytical technique was developed for the determination of the sulfuric acid aerosol produced in the reaction. The aerosol particles were collected by a high velocity impactor which removed 50 per cent of 0.11 micron sulfuric acid particles and 100 per cent of the particles greater than 0.20 microns. The acid particles were impacted on a film impregnated with thymol blue, an acid-base indicator. The color change resulting from the sulfuric acid drops was measured by a photo-electric colorimeter. The film was calibrated by impaction of known quantities of sulfuric acid aerosol and could be used to determine analytically from 0.01 to 0.20 micrograms of sulfuric acid.

The results with the sunlamp at 5, 10, 20, and 30 p.p.m. sulfur dioxide for reaction times up to three hours showed that the reaction is first order with respect to the sulfur dioxide concentration and that the rate of conversion to sulfuric acid is 0.68 per cent

per hour. The particle size of the sulfuric acid aerosol varied from a mass median diameter of 0.19 to 0.45 microns and increased both with time and initial sulfur dioxide concentration. The data indicate that the number of particles per unit volume remains constant after the initial nucleation and further reaction results in growth by condensation of the acid and water vapor.

The probable reaction mechanism is the collision of an activated sulfur dioxide molecule with oxygen to form sulfur trioxide and subsequent reaction with water vapor. One p.p.m. nitrogen dioxide added to 10 and 20 p.p.m. sulfur dioxide gave no significant increase in the reaction rate. The presence of sodium chloride nuclei and variation in the relative humidity of the water vapor also had no measurable effect on the reaction rate. No increase in the sulfuric acid aerosol was found when the aerosol formed by the photochemical reaction was permitted to remain in the reaction chamber in the presence of sulfur dioxide in the dark. However, it is possible that an appreciable rate of oxidation would occur in the liquid phase if sulfur dioxide were absorbed in a natural water fog in the presence of dissolved catalyst.

Because of the inability to control the reaction temperature and variation of ultraviolet intensity, only qualitative results were obtained in natural sunlight. The results indicate a probable conversion of about 0.1 per cent per hour in intense sunlight. Measurements were made of the ultraviolet intensity in sunlight in the region 2950 to 3200 Å. during six hour periods on different days. Data obtained with ultraviolet filters showed no measurable amount of radiation in sunlight below 3000 Å.

The gas phase oxidation of sulfur dioxide is not significant in reducing visibility in the atmosphere under ordinary conditions. One p.p.m. sulfur dioxide would have to be exposed to approximately 100 hours of intense solar radiation to reduce the visibility to one mile.

Microfilm copy of complete manuscript of 110 pages, \$1.38. Enlargements 6" x 8", 10¢ per page. Library of Congress card number MicA54-447.

#### CHARACTERISTICS OF TURBULENT FLOW IN DUCTS WITH TEMPERATURE GRADIENT

(Publication No. 7007)

Richard Warring Kunstman, Ph.D.  
University of Illinois, 1952

The present work is part of a long-range program which has as its objective the investigation of the structure of turbulence as it pertains to the problems of momentum, mass, and heat transfer. This report deals with the construction and testing of a constant

current Hot-Wire Anemometer and its application to turbulence studies in ducts with temperature gradients.

This anemometer has an amplification range from 8 to 20,000 with a flat response from 20 to 55,000 cycles per second. The frequency response of the compensating circuit matches the response of wires, for which the time constants are one millisecond or less, with an error of 5.5% at 55 kilocycles and less than 1% at 20 kilocycles. A new system was devised for determining the proper compensator adjustment, which involves the application of a modulated high frequency current to the wire. This method was compared with and found superior to the method of Kovasznyai for the present applications.

The turbulence measurements were made in air flowing at a mass velocity of 7.5 lb./sec.sq.ft. through a 10 foot section of 2 inch I.D. stainless steel tube. The heating medium for the non-isothermal study was hot water (105° C) circulated through a 2-1/2 inch I.D. jacket. Mean velocities and temperatures were measured with an impact tube and a copper-constantan thermocouple.

In the isothermal (25° C) run the volumetric average velocity was 103 feet per second which corresponded to a Reynolds number of 103,000. The axial turbulence intensity varied from 4.5% at the center to 12.5% near the wall, the radial intensity varied from 2.6% to 5.3% and the correlation coefficient ranged from 0.1 to 0.4. The turbulent shear stress, calculated from the measured "Reynolds Stresses" showed good agreement with the shear calculated from the pressure drop through the tube.

In the non-isothermal run, the air temperature rose from 25° C at the entrance to 63° C at the outlet. The volumetric average velocity at the outlet was 116 feet per second corresponding to a Reynolds number of 97,000. The radial turbulent velocity intensity varied from 2.3% at the center to 5.5% near the wall and showed reasonable agreement with the isothermal profile. The turbulent shear stress was again in agreement with the shear calculated from pressure drop measurements. The quantities  $\overline{uv}/\bar{U}^2$  and  $\overline{v\theta}/\bar{\theta}\bar{U}$ , which are measures of the turbulent momentum transfer and heat transfer respectively, were found to vary from 0 at the center to  $25 \times 10^{-4}$  near the wall and were in agreement with each other within the limits of rather large experimental errors. This agreement was shown to be a necessary condition for the "Reynolds analogy", between heat and momentum transfer, to hold.

The turbulence quantities are defined as follows:

$u$	- fluctuating axial velocity	ft./sec.
$v$	- fluctuating radial velocity	ft./sec.
$\theta$	- fluctuating temperature	°K
$\bar{U}$	- average axial velocity	ft./sec.
$\bar{\theta}$	- average difference between air and wall temperature	°K

Microfilm copy of complete manuscript of 177 pages, \$2.21. Enlargements 6" x 8", 10¢ per page. Library of Congress card number MicA54-448.

## THE EFFECT OF PRESSURE ON DIFFUSION IN SINGLE CRYSTALS

(Publication No. 6960)

Tung Liu, Ph.D.  
University of Illinois, 1953

Very few attempts have been made to study the nature of anisotropic substances, which are gradually becoming more important in modern industry. The purpose of this work was to study the anisotropy of zinc, which has a hexagonal crystalline structure, by means of self-diffusion experiments.

Measurements were made on the rate of self-diffusion in single crystals of zinc along the directions both parallel and perpendicular to the C-axis. The effects of compression by an applied force and hydrostatic pressure up to 10,000 atmospheres on the rate of diffusion were studied. The self diffusion coefficients of polycrystalline zinc were also measured under both atmospheric pressure and compression.

The rate of self-diffusion in single crystals of zinc was found to be always larger in the direction parallel to the C-axis, while the enthalpy of activation was found to be always smaller in this direction. Both compression and hydrostatic pressure tend to reduce the rate of self-diffusion, the greater effect being observed in the direction parallel to the C-axis. Compression perpendicular to the direction of diffusion gave essentially the same effect as compression in the direction of diffusion. The enthalpy of activation was found to be increased 30 percent by the application of a pressure of 8,000 atmospheres and to be decreased slightly by compression. The anisotropy in the rate of diffusion was found to decrease with increased hydrostatic pressure. The self-diffusion coefficients of polycrystalline zinc were found to be intermediate between the observed values in the two directions (parallel and perpendicular to the C-axis) in single crystals and to be closer in magnitude to the values observed in the direction perpendicular to the C-axis.

The observed phenomena can be explained by considering the change of the lattice structure due to pressure and compression. The concept of activation length, which was found to be advantageous in the discussion of anisotropic bodies, was introduced. It signifies the local linear expansion in the direction of diffusion when an atom is activated. Under atmospheric pressure the activation lengths for self-diffusion in single crystals of zinc were found to be about 100 percent of the interatomic distance in the direction parallel to the C-axis and about 70 percent of the interatomic distance in the direction perpendicular to the C-axis. A decrease in activation length was found to accompany the increase in hydrostatic pressure. Under a pressure of 10,000 atmospheres, it dropped to about 60 percent of the interatomic distance in both directions.

Any attempt at quantitative thermodynamic calculations suggests the need of a special version of thermodynamics applicable to anisotropic substances. Techniques have been developed which permit making high temperature measurements (up to 350° C) at high pressures (up to 10,000 atmospheres).



Microfilm copy of complete manuscript of 90 pages, \$1.13. Enlargements 6" x 8", 10¢ per page. Library of Congress card number MicA54-449.

### CONDENSATION IN THE PRESENCE OF INERT GASES

(Publication No. 6976)

William Bennett Retallick, Ph.D.  
University of Illinois, 1953

This is a continuation of the work on rates of enthalpy transfer in packed towers which was started by David L. McKinley.<sup>1</sup> The variation of the coefficients for enthalpy transfer with the properties of the system was studied so the values can be predicted for other systems used with the same packing.

This work covers the systems of water, tetrachloroethylene, and sulfur with inert gases. Tetrachloroethylene was studied because its properties are different from those of water and the method for analyzing the data on the air-water system is inadequate for other systems. Sulfur was studied because its condensation into a circulating liquid stream is used commercially in the recovery of sulfur from hydrogen sulfide. Some of McKinley's work on water was repeated and some of his data on dibutylphthalate were recalculated to take advantage of new calibrations of the equipment and refinements in experimental technique. His conclusions were revised in the light of the more extensive data available.

When heat and mass are simultaneously transferred between a gas phase and a pure liquid in a countercurrent tower, neither of the transfer processes may be analyzed independently. A single solution is possible, however, if enthalpy is considered as the entity transferred. For most systems a modified enthalpy must be used as the driving potential causing the enthalpy transfer. The modification may be derived from the analogy between the heat and mass transfer coefficients. It reduces to the simple enthalpy for the unique system of air and water. A graphical method based on the modified enthalpy potential has been developed for calculating enthalpy transfer coefficients from experimental data. This is a modification of the method proposed by Mickley for the water-air system.<sup>2</sup> The graphical method was also adapted to the design of cooler-condensers for the recovery of vapors from inert gas systems.

The experimental apparatus was essentially the same as that used by McKinley. The tower was one foot square and packed to a depth of 2-1/4 feet of General Refractories Company Drip Point Grid Tile No. 6897. The liquid to the tower was distributed over the packing by an eighteen point distributor. The inlet gas was air or hot combustion gases supplied by a gas burner. A water spray quench controlled the temperature of the combustion gases. The air supply was metered with an orifice and a venturi which were calibrated against a standard Taylor flow nozzle. The new calibration of the orifice differed considerably from that used by McKinley and all of his data for which the orifice was

used were recalculated. Humidities of the gas entering and leaving the tower were measured by weighing the vapor absorbed from a metered gas sample by a desiccant. Vapor concentrations were not measured in the work on sulfur but the gas was assumed to be saturated.

The individual phase transfer coefficients determined for water and tetrachloroethylene systems showed that the resistance of the liquid phase is a small part of the total resistance to enthalpy transfer. The coefficients for gas cooling were generally higher than those for gas heating. This difference was independent of the direction of mass transfer or net enthalpy transfer and was not caused by the temperature of the gas stream or the gas film. The gas phase coefficients obtained for gas cooling with tetrachloroethylene and water were approximately proportional to the 0.8 power of the gas velocity and to the 0.5 power of the vapor diffusivity. Runs made with and without fog on tetrachloroethylene, water, and sulfur showed that fog formation does not noticeably affect the enthalpy transfer coefficients. This was also found by Mizushima and Nakajima.<sup>3</sup> McKinley proposed that the coefficients were increased by fog formation, but he compared overall coefficients from two sets of runs in which the effect of fog was not isolated.

Fog formation is likely when a vapor of low diffusivity is condensed from an inert gas. There is a limit to the cooling and dehumidification that may be accomplished for any initial gas conditions without supersaturation occurring in the gas film. In the design of a cooler condenser, the formation of fog in the main gas stream, or in the gas film, may be predicted so that the design can be adapted to prevent fog if the potential for fog formation is not too great.

1. McKinley, D. L., Ph.D. thesis, University of Illinois, 1952.

2. Mickley, H. S., *Chem. Eng. Prog.* **45**, 739 (1949).

3. Mizushima, T., Nakajima, M., et al., *Chem. Eng. (Japan)* **16**, 345 (1952).

Microfilm copy of complete manuscript of 130 pages, \$1.63. Enlargements 6" x 8", 10¢ per page. Library of Congress card number MicA54-450.

### MASS TRANSFER BETWEEN LIQUID DROPS AND A CONTINUOUS LIQUID PHASE IN A COUNTERCURRENT FLUIDIZED SYSTEM: LIQUID-LIQUID EXTRACTION IN A SPRAY TOWER

(Publication No. 6833)

Charles L. Ruby, Jr., Ph.D.  
Princeton University, 1952

This thesis presents the results of a study of rates of mass transfer in the steady state between masses of liquid drops and a continuous countercurrently flowing liquid phase, using a 1.90" I.D. pyrex glass column with a total length of 25". The ultimate objective was to develop a method of predicting mass transfer rates in fluidized systems containing a

discontinuous fluid phase such as spray type liquid-liquid extraction towers.

The interfacial areas for mass transfer were determined using a new experimental approach; this method employed stroboscopic counting of drops at the nozzle and direct measurements of the discontinuous phase holdup.

The mass transfer results are not masked by the consequences of end effects in the column; this was accomplished by sampling the continuous phase at two intermediate positions in the column.

Binary systems only were studied in which cases it can be assumed that mass transfer coefficients in the continuous phase are directly measured. The discontinuous phase was saturated with the continuous phase, the result being net unidirectional transfer of dispersed phase material to the continuous phase and elimination of the resistance to mass transfer in the discontinuous phase. Four systems with greatly different physical properties have been studied. A wide range of Reynold's Number was investigated. The systems are as follows: isobutanol dissolving into water, water dissolving into isobutanol, benzyl alcohol dissolving into n-hexane, and nitrobenzene dissolving into ethylene glycol.

Continuous phase film mass transfer coefficients were found to be practically independent of flow rates of both the continuous and discontinuous phases. Mass transfer coefficients for the four systems were successfully correlated by means of a modified  $j$  factor — Reynold's Number plot.

Microfilm copy of complete manuscript of 109 pages, \$1.36. Enlargements 6" x 8", 10¢ per page. Library of Congress card number MicA54-451.

## ENGINEERING, CIVIL

### A METHOD FOR CALCULATING THE NATURAL FREQUENCIES OF CONTINUOUS BEAMS, FRAMES, AND CERTAIN TYPE OF PLATES

(Publication No. 6993)

Anestis Stavrou Veletsos, Ph.D.  
University of Illinois, 1953

A method has been presented in this dissertation for the determination of the undamped natural frequencies and of the corresponding natural modes of flexural vibration of elastic structures. Continuous beams on rigid or flexible supports, continuous frames without sidesway, symmetrical single-bay multi-story frames for which the joints are free to translate, and continuous plates having two opposite edges simply supported have been considered. The masses of the members of each structure have been assumed to be uniformly distributed along each member.

The method is a generalization of Holzer's method

for calculating the natural frequencies of torsional vibration of shafts and, like Holzer's method, it has been reduced to a routine scheme of computation which, when repeated a sufficient number of times, will give the natural frequencies of the system to any desired degree of accuracy. The method is based on the fact that the exciting couple necessary to maintain a dynamical system in a steady-state of forced vibration with finite amplitudes becomes equal to zero at any one of the natural frequencies of the system.

Extensive tables of numerical values for the various quantities entering in the analysis are also presented. With these tables the calculations required in the application of the method to particular problems are simplified greatly. The tabulated values may be used also with other analytical techniques as well as for the analysis of the steady-state forced vibration of structures.

Microfilm copy of complete manuscript of 222 pages, \$2.78. Enlargements 6" x 8", 10¢ per page. Library of Congress card number MicA54-452.

## ENGINEERING, ELECTRICAL

### A WEIGHTED PCM COMMUNICATIONS SYSTEM

(Publication No. 7015)

Edward Bedrosian, Ph.D.  
Northwestern University, 1953

The usefulness of radio communications is limited by the ability of the system to protect the transmitted information from the interfering effects of noise. Improved performance has been sought by either taking all measures possible to assure that a minimum of noise is added to the signal or by developing methods of modulation which are inherently insensitive to noise. Research along the latter lines has yielded angle modulation and a variety of forms of pulse modulation which display excellent "noise-cleaning" properties. The latest of these is pulse code modulation, or PCM, an improved form of which is the topic of investigation of this work.

A signal is prepared for PCM transmission by the processes of sampling, quantizing and encoding. The signal is sampled at a rate sufficient to specify it completely and the sample values are quantized by comparison with a set of discrete levels. They are finally expressed as binary numbers and represented by sequences of pulses.

The noise-cleaning property of PCM is seen to be derived from the manner by which the receiving function is altered. The receiver need only decide whether pulses are present or not at the various pulse positions; a process which can be performed with great accuracy in the presence of considerable noise.



The process of weighting is proposed as a method of improving PCM. The binary representation of the sample value as a succession of pulses means that each pulse conveys information about a different power of the base 2. Thus each pulse has a different importance to the reconstructed signal. It is the purpose of weighting to adjust the amplitudes of the various pulses within each code group in such a fashion as to make the probability of error associated with each pulse commensurate with its value to the reconstructed signal.

The problem of obtaining the desired weighting function was divided into three main avenues of investigation. These were:

- a. An analysis of typical detectors in order to evaluate their ability to determine the presence or absence of the code pulses.
- b. An experimental investigation of the durations of noise bursts in order to determine how burst length affects error production.
- c. A derivation of the weighting function on the basis of minimizing the noise power in the output due to errors in transmission as determined from a) and b) above.

The synchronous detector was compared to the linear detector followed by slicing (pulse estimation) at the average and optimum levels and was found to be superior both with respect to the total probability of error and the distribution of errors between the detection of pulses and no pulses.

A probability density of durations of noise bursts above various clipping levels was obtained from experimental data and shown to be Maxwellian in form. It was found that multiple errors due to long noise bursts could be neglected. Partial errors due to short noise bursts could also be neglected if the gating pulses used in the pulse estimation were sufficiently narrow.

The weighting function was obtained as the solution to the equations resulting from minimizing the noise power under the constraint of constant signal power. Typical sets of pulse amplitudes were given for systems with various numbers of digits and performance curves were presented giving the output signal-to-noise ratio as a function of the input signal-to-noise ratio for both weighted and unweighted PCM. The process of weighting was shown to decrease the threshold signal-to-noise ratio by from 1 to 2 decibels, a significant advance toward the ultimate 8 decibel improvement theoretically possible.

Microfilm copy of complete manuscript of 106 pages, \$1.33. Enlargements 6" x 8", 10¢ per page. Library of Congress card number MicA54-453.

## COMMUNICATIONS WITH CLIPPED SPEECH SIGNALS

(Publication No. 7024)

Theodore Vincent Crater, Ph.D.  
Northwestern University, 1953

When an electrical current or voltage representing a voice signal is symmetrically "clipped" the loss of quality of the voice wave depends on the ratio of the highest peak amplitudes to the clipping level. When this ratio is made arbitrarily large the speech wave is converted to a rectangular wave possessing only two amplitudes. Such a wave is referred to as an "infinitely-clipped" speech wave. It has been found experimentally that an infinitely-clipped speech wave possesses surprisingly high intelligibility; if the speech wave is passed through a differentiator prior to the clipping operation the loss of intelligibility is almost negligible.

From the point of view of communications engineering this result raises numerous questions in two general areas. One of these concerns the nature of the phenomenon of retention of intelligibility by a violently distorted speech wave. The other concerns the possible usefulness of infinite clipping in practical communication systems. Both of these problems are investigated in this paper.

The experimental observation that infinite clipping affects whispered speech in very much the same way that it affects normal speech is the starting point of a theory of intelligibility. A whispered speech wave may be described as a non-stationary Gaussian random process. The description of such a process requires only a knowledge of the time-dependent correlation function. It follows that the only property of a speech wave, whispered or voiced, which is essential to intelligibility is the correlation function or its Fourier transform, the power spectrum. Thus the loss of intelligibility resulting from a prescribed operation on the speech wave may be related to the effect of the operation on the correlation function.

The effect on the correlation function due to performing any of an extensive class of non-linear operations on a whispered-speech wave may readily be computed. In the case of infinite clipping the result indicates that for optimum intelligibility the infinite clipper should be preceded by a linear filter such that the average power spectrum of the filtered speech at the input to the clipper is approximately constant over the intelligibility range of 400 to 3500 cycles per second. Frequency components outside this band should be severely attenuated. The whispered-speech example serves as an approximation in the case of voiced speech. The direct determination of the effect of infinite clipping on the correlation function or power spectrum of a voiced-speech wave is difficult because of uncertainty concerning the amplitude distribution of voiced speech.

The loss in intelligibility due to other types of non-linear operations may also be investigated by means of the correlation function. The additional loss in intelligibility resulting when the infinitely-clipped speech wave is quantized in time is estimated in this way.

Concerning the second problem, it is shown that the rectangular wave-shape of the infinitely-clipped speech signal offers an advantage in noise suppression. By repeating the clipping operation in the receiver a substantial reduction of noise may be obtained. The deterioration of the received signal due to noise is evaluated in terms of the signal-to-noise ratio and in terms of the cross-correlation of the transmitted signal and the received signal, for telephonic transmission, amplitude modulation using an envelope detector, and amplitude modulation using a synchronous detector.

The amplitude-modulation system using infinite clipping obtains noise reduction in exchange for bandwidth, just as does frequency modulation. It possesses an "improvement threshold" at about unity signal-to-noise ratio, as does an f-m system. The disadvantage of the loss of quality introduced by clipping is offset by the fact that for very low channel signal-to-noise ratios the clipper in the receiver may be by-passed, in which case the intelligibility will be greater than with either an f-m or an ordinary a-m system. The simplicity and efficient use of energy of the a-m system using infinite clipping indicate that it may be useful for military field communications.

Microfilm copy of complete manuscript of 102 pages, \$1.28. Enlargements 6" x 8", 10¢ per page. Library of Congress card number MicA54-454.

#### MATHEMATICAL ANALYSIS AND TECHNIQUE FOR NON LINEAR SERVOMECHANISM PROBLEMS

(Publication No. 7004)

Kouan Fong, Ph.D.  
University of Illinois, 1951

In the first part non-linear servomechanisms are analyzed by pseudolinear analysis. All the non-linear elements are replaced by external applied forcing functions of time which are equal to the force consumed by these elements at any instant. The differential equations of motion of the system are changed into a set of non-linear Volterra integral equations of the second kind. Such equations are solved by successive substitution and successive approximation methods by using the Green functions responses to the impulsive force and the superposition theorem in each step.

Two very simple cases which contain only one non-linear element each are treated as examples.

Then the general system containing any number of non-linear elements is discussed. The following two types of non-linearity are considered. (a) The force consumed by non-linear elements can be expressed as absolutely convergent Taylor's series in all the dependent variables  $q_j$ 's and  $i_j$ 's with the constant term and all the linear terms not present. (b) The force consumed by the non-linear elements can be expressed as continuous functions of all the dependent variables which satisfy the Lipschitz condition.

Let the corresponding linear system obtained by neglecting all the non-linear elements in original system be assumed to have distinct characteristic roots. All real parts of roots have an upper bound  $-\alpha$ ,  $\alpha$  positive. And after certain auxiliary conditions are specified, the following two theorems are established.

The first theorem concerns the system containing the non-linear elements of type (a). In case the applied forcing functions are dominated by functions of the type of  $C \exp(-\xi t)$ . Then the responses are dominated by functions of similar type  $C \exp(-\zeta t)$  where  $\zeta = \text{Min.}(\alpha, \xi)$ .

The second theorem concerns the system containing the non-linear elements of type (b). In case the applied forcing functions are dominated by a constant, the responses are also dominated by constants.

And the two theorems established before are restated for the analysis of non-linear servo-mechanisms with an added corollary to extend the first theorem to asymptotic equilibrium cases.

The second part discusses the transient behavior of a two-phase induction motor servomotor, used in an open or closed cycle control system, by neglecting the effect produced by electrical transients. The analysis is carried out by the following procedure:

(1) Resolving the applied voltage into symmetrical components.

(2) Using sections of sinusoidal curve to approximate the slip torque-ratio relationship.

(3) Obtaining a simplified expression for the torque developed at motor shaft as a function of normalized velocity and control voltage.

(4) Solving the differential equation of motion obtained with certain approximations for the following cases:

(a) For open cycle control system with viscous damping (with or without control voltage) and with combined viscous and Coulomb damping.

(b) For closed control system of second order with step-position signal.

Microfilm copy of complete manuscript of 101 pages, \$1.26. Enlargements 6" x 8", 10¢ per page. Library of Congress card number MicA54-455.

#### DELAY-TYPE COMPENSATORS FOR CONTROL SYSTEMS

(Publication No. 7031)

Dennis John Ford, Ph.D.  
Northwestern University, 1953

In this study, a compensator is defined as a device placed in cascade with a control system for the purpose of giving the combination, or compensated system, some desired response characteristics. The delay compensator is a compensator which has time delay elements as an intimate part of its structure. In general, this thesis is concerned with the analysis and design of that class of delay compensators which possess a transversal type network structure. Although the study is approached from the point of view of electrical devices, the principles developed are



applicable to linear systems made up of mechanical, hydraulic, pneumatic, or acoustic devices, and combinations of these. In fact, the principles are applicable to any system which may be adequately described by a set of linear relations.

The design of delay compensators is based upon a given set of compensated-system response specifications. This response criteria may be specified in the time domain. In this domain, a steady-state, one-to-one correspondence of the response with a polynomial-type command may be required, as well as a specified, short, non-oscillatory transient response. In contrast, the response criteria may be specified in the frequency domain. In the latter domain, for a finite frequency range, constant amplitude response and a small, predetermined, linear phase shift may be required. Both bases of design are given attention in this thesis.

The five different types of delay compensator units investigated in this study are:

1. Amplitude Response Compensator, ARC
2. Signal Component Control Compensator, SCC
3. Modified Fourier Series Compensator, FSC
4. Modified Fourier Integral Compensator, FIC
5. Modified Taylor's Series Compensator, TSC

Although not originally intended for use as a compensator and not satisfactory when so employed, the ARC unit is mentioned for its historical interest. The SCC device was developed previously on the basis of time domain considerations. New theoretical procedures based upon frequency domain analyses are presented which shed additional light upon the performance of these units 1 and 2. Somewhat similar theoretical approaches are evolved which lead to the development of the new units listed above as 3, 4, and 5.

The FSC and FIC units provide both amplitude and phase compensation simultaneously. The resulting compensated-system amplitude response (using either the FSC or FIC units) exhibits an oscillatory behavior typical of Fourier Series type approximations. The corresponding phase characteristic is linear with frequency but is usually of rather large magnitude.

The TSC Compensator is judged to be the most desirable unit evolved in this research. Two types of TSC structures are presented — one, a minimum-tap TSC, and the other, a greater-than-minimum tap TSC. The difference between the two types is that the latter produces greater constant-gain bandwidth (with the same phase characteristic) than the former, assuming that the same length of delay line is used for each. In both cases, a decrease in the length of the delay line produces simultaneously (in the compensated-system response characteristics) an increase in the constant-gain bandwidth and a reduction in the magnitude of the linear phase lag. The limit to this type of compensation is imposed by the saturation characteristics of the control system.

A short investigation is made of the probable effect of including the compensator-control system combination in a feedback loop. The general conclusions are that such a feedback system will produce approximately the same transient response with much greater tendency towards instability than the normal

open-loop system. Some possibilities are discussed for the use of minor loop feedback circuits incorporating the delay compensator to improve the performance of control systems which contain specific types of nonlinearities.

Microfilm copy of complete manuscript of 179 pages, \$2.24. Enlargements 6" x 8", 10¢ per page. Library of Congress card number MicA54-456.

## INVESTIGATIONS AND ANALYSES OF SOME VIBRATIONAL SYSTEMS INCORPORATING NON-LINEAR ELEMENTS

(Publication No. 7058)

Evan Richard Owen, Ph.D.  
Northwestern University, 1953

This research has two main purposes. The first is to illustrate by specific examples the uses of non-linear elements in relatively simple vibration absorbing systems and the second is to develop a linear approximation for a specific vibrational system which involves numerous non-linear elements.

Based on the existing literature means of vibration isolation and typical characteristics of non-linear damping elements and springs are described. Then, particular potential objectives for vibration absorbing systems are enumerated.

A single-degree-of-freedom system is studied from the standpoint of the significant objectives. This system, the performance of which is described by a second-order differential equation, is analysed by a phase plane approach. When the maximum available damping force is known, that type of non-linear damping required is found which will bring this system to a certain specified lower energy level in the least time. This analysis is extended to determine the system performance when a bounded but varying damping force is employed. Next, the uses of non-linear elements in a two-degree-of-freedom system are studied. Here it is sought to limit the displacement of a mass and to limit the force transmitted by the suspension of this mass to a fixed base. It is proposed to use a nearly constant force (preloaded) spring to suspend the disturbed mass and a non-linear tuned damper to cancel out the variational force applied to that mass. By assuming a constant force suspension spring this fourth-order system is approximated by two independent second-order systems. Experimental verification is provided and it is shown that during steady-state performance the non-linear system yields a substantial improvement when compared to the conventional linear system.

A method of analysis is developed for determining the performance of a low-pass, lossless, ladder network (analogous to a low-pass mass-spring cascaded system) the shunt capacitance elements of which are non-linear. This method of analysis begins with the establishment of a linear impedance to replace the non-linear capacitive elements. The value of each capacitance is written as a function of the maximum

voltage across the element. These equivalent capacitive reactances are inserted in the difference equations of the ladder network. The difference equations are written in a form such that the shunt impedance terms are functions of the amplitude of voltage distribution along the ladder network. The equations lead directly to input-output voltage relations. The calculations of the latter relations are checked experimentally for a two-section non-linear network.

Microfilm copy of complete manuscript of 248 pages, \$3.10. Enlargements 6" x 8", 10¢ per page. Library of Congress card number MicA54-457.

### ERROR DETECTION AND CORRECTION IN BINARY PARALLEL DIGITAL COMPUTERS

(Publication No. 7008)

James Evans Robertson, Ph.D.  
University of Illinois, 1952

Within recent years, techniques have been developed for suitably coding redundant information for transmission with message information in such a way that single errors in the received information can be corrected. The techniques, as described in "Error Detecting and Error Correcting Codes," by R. W. Hamming,<sup>1</sup> are applicable for correction of single errors within blocks (a block being a sequence of binary digits of fixed length) of message and redundant binary digits. The number of redundant digits required for correction of a single error in the block of digits is approximately equal to the logarithm of the number of binary digits in the block. A single error is defined as a change in one of the digits of the block transmitted.

It is the purpose of the thesis to extend the techniques developed for transmission of information to apply to computation within a binary parallel digital computer. The transmission of a block of binary digits comprising message and redundant digits from transmitter to receiver is analogous to the transfer of a block of binary digits comprising arithmetic and redundant digits from one register to another within a parallel digital computer. The message digits transmitted within a block are thus analogous to the set of arithmetic digits dealt with in parallel in a digital computer. The analogy between information transmission and digital computation breaks down when the transformations necessary for effecting computation are considered. The major part of the thesis is therefore devoted to consideration of the arithmetic transformations required for computation which have no counterpart in a transmission system.

First consideration is necessarily given to fundamentals: logical design techniques basic for computer design, a description and matrix formulation for the Hamming codes, circuitry for error correction, and reliability and other considerations for evaluating the usefulness of an error-correcting system.

Attention is next turned to the arithmetic unit.

Conventional arithmetic unit designs employ addition circuits with propagating carries; the conventional design cannot be used since a single malfunctioning component in the carry circuitry can produce errors in all digits over which the carry would propagate. An arithmetic unit design based upon transformations logically simpler than addition with carries is described. Methods of effecting the arithmetic operations of addition, subtraction, multiplication, and division are discussed. The arithmetic unit design presented contains a number of novel features which may be of interest in future parallel digital computer designs.

The major difficulties which arise in the design of an error-correcting digital computer are associated with the generation of redundant digits during arithmetic transformations. Before a transformation is made, the block of arithmetic and associated redundant digits conveys sufficient information to specify the correct configuration of the block of digits, even though a single error has occurred. For each transformation upon the arithmetic digits, a corresponding transformation generating redundant digits must be made in such a way that the resultant block of arithmetic and redundant digits can also be sensed for correction of a single error. Generation of redundant digits is discussed for each of the transformations necessary for effecting the operations of arithmetic.

Consideration is also given to design of control circuitry for an asynchronous computer. In an asynchronous control, each arithmetic transformation corresponds to a unique state of a set of control flip-flops; a sequence of transformations corresponds to a sequence of states of control flip-flops. Information considerations lead to techniques for minimizing the number of control flip-flops. Techniques for determining the correspondence between control flip-flop states and arithmetic transformations are also described. Problems arising in connection with automatic error correction in control circuitry are discussed briefly.

The thesis is concluded by a general discussion of a variety of possible methods of automatic error correction. A qualitative, and in some cases conjectural, discussion of difficulties to be encountered with each method is presented.

Some solutions to problems presented in the thesis are generally applicable in the field of digital computation; other solutions present limited applicability. The arithmetic unit design has several features which warrant its consideration in future parallel computer designs. The control design techniques leading to a minimum flipflop design were successfully applied in a limited way in the design of the ORDVAC.<sup>2</sup> Solutions to problems arising in connection with redundant digit generation are specifically applicable only to the design of a computer employing the Hamming single error correcting code. Problems encountered in future investigations of automatic error correction in digital computers may be similar to those for which solutions were obtained in the thesis, particularly if error correcting codes based upon the same definition of a single error are employed.



1. Hamming, R. W., "Error Detecting and Error Correcting Codes," *Bell System Technical Journal* Vol. 29 (April 1950) pp. 147-160.

2. Meagher, R. E., and Nash, J. P.; "The ORDVAC," *Review of Electronic Digital Computers* (Proceedings of the Joint AIEE-IRE Computer Conference, Philadelphia, December 10-12, 1951), published February 1952 by the American Institute of Electrical Engineers. pp. 37-43.

Microfilm copy of complete manuscript of 165 pages, \$2.06. Enlargements 6" x 8", 10¢ per page. Library of Congress card number MicA54-458.

## ENGINEERING MECHANICS

### AN ITERATIVE TRANSFORMATION PROCEDURE FOR SOLVING CHARACTERISTIC-VALUE PROBLEMS IN STRUCTURAL MECHANICS

(Publication No. 7005)

Myron Lee Gossard, Ph.D.  
University of Illinois, 1949

#### Introduction

An iterative transformation procedure for solving the characteristic-value problems of structural mechanics is developed, proved, and applied in the thesis. To facilitate presentation, the discussions are based mainly on the problem of calculating modes and frequencies of natural vibration of beams in flexure.

The first part of the thesis is theoretical in nature. It begins with a review of the basic elements of natural vibration, and a statement and proof of the Stodola-Vianello iterative method for finding the first natural mode and frequency of vibration. Then follows as the feature of the paper the determination of second and higher modes and frequencies by means of the iterative transformation procedure. The procedure is developed in algebraic terms through physical reasoning, and at the same time its convergence is mathematically proved.

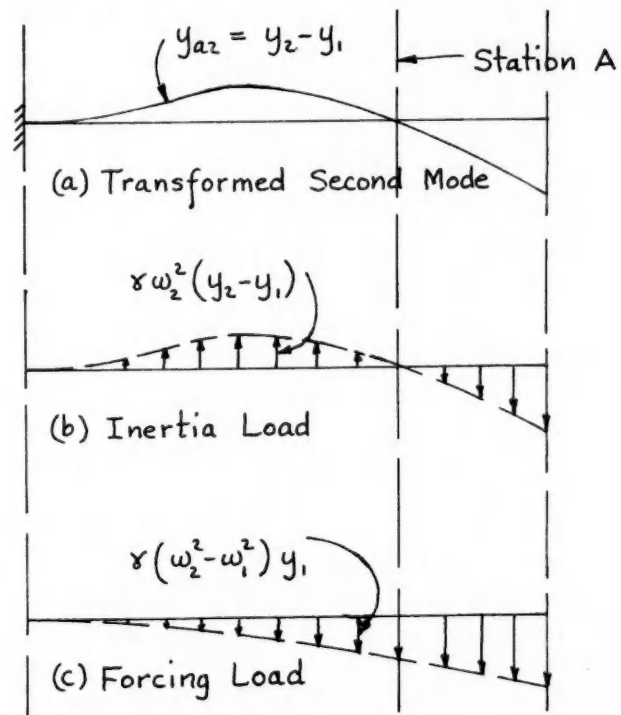
In the latter part of the thesis, three numerical examples on natural and forced vibrations of cantilever beams are given with detailed explanations. These provide a routine that may be followed without reference to the theory, and present certain techniques that cannot be easily treated in the theory.

#### Principle and Convergence of the Iterative Transformation Procedure

The iterative transformation procedure is a device that transforms the problem from one of finding higher natural modes directly, to one of finding certain "transformed modes" from which the higher natural modes are easily computed. These transformed modes are linear combinations of the natural modes and have all the properties of the natural modes ex-

cept for their nodal locations which are under the control of the computer. This controllability of the nodal locations permits the development of sweeping operations that do not rely on the use of orthogonality relations, resulting in a process that is simpler, more accurate, and more naturally adapted to numerical work than the more commonly used methods founded upon orthogonality relations.

The basis of the procedure is illustrated in the figure. With the natural modes



$y_1, y_2, y_3, \dots$  assumed to be normalized to unity at station A, the transformed second mode  $y_{a2}$  is defined as that linear combination of the first two natural modes having zero ordinate at station A. In order that this linear combination may vibrate harmonically at the second natural frequency  $\omega_2$ , there must be present, in addition to the inertia load

$\gamma \omega_2^2 (y_2 - y_1)$ , an external forcing load  $\gamma (\omega_2^2 - \omega_1^2) y_1$ .

The sketches of the figure represent amplitudes of the motion and of the forces, all of which oscillate at frequency  $\omega_2$ . The mass per unit length is represented by  $\gamma$ . The inertia load acting alone produces a deflection different from zero at station A, but the deflection produced by the forcing load must bring the total deflection at station A to zero. The effect of the forcing load is represented in the iterative procedure by a sweeping operation in which a first mode shape (already known from preceding calculations) is deducted from the deflection produced by the inertia loads in an amount sufficient to make the total deflection zero at station A.

The function of the iterative process is to determine, from an assumed first approximation, the true transformed second mode. The first approximation will in general contain components of all the natural modes. Thus

$$\begin{aligned}
 {}_1y_{a2} &= c_1 y_1 + y_2 + c_3 y_3 + c_4 y_4 + \dots \\
 &= y_{a2} + (1+c_1)y_1 + c_3 y_3 + c_4 y_4 + \dots \quad (1)
 \end{aligned}$$

represents the assumed deflection of the first cycle of iteration. The thesis shows that the inertia load corresponding to this assumed deflection at the arbitrary frequency  $\omega$  produces a deflection given by

$$\begin{aligned}
 {}_1y'_{b2} &= \frac{\omega^2}{\omega_2^2} y_{a2} + \frac{\omega^2}{\omega_2^2} \left(1 + \frac{\omega_2^2}{\omega_1^2} c_1\right) y_1 \\
 &\quad + \frac{\omega^2}{\omega_3^2} c_3 y_3 + \frac{\omega^2}{\omega_4^2} c_4 y_4 + \dots \quad (2)
 \end{aligned}$$

The sweeping operation of the first cycle deducts from the deflection represented by equation (2) a first mode shape which brings the resultant deflection at station A to zero. Thus the resultant or final derived deflection of the first cycle is given by

$$\begin{aligned}
 {}_1y'_{a2} &= [{}_1y'_{b2} - y_1({}_1y'_{b2})_A] \\
 &= \frac{\omega^2}{\omega_2^2} y_{a2} + \frac{\omega^2}{\omega_3^2} c_3 (y_3 - y_1) + \frac{\omega^2}{\omega_4^2} c_4 (y_4 - y_1) + \dots \quad (3)
 \end{aligned}$$

in which the term  $[-y_1({}_1y'_{b2})_A]$  represents the sweeping operation.

The deflections of successive cycles of iteration, each begun with the final derived deflection of the preceding cycle, are represented in the following expressions for the  $n^{\text{th}}$  cycle.

$$\begin{aligned}
 {}_n y_{a2} &= {}_{n-1} y'_{a2} \\
 &= \left(\frac{\omega^2}{\omega_2^2}\right)^{n-1} y_{a2} + \left(\frac{\omega^2}{\omega_3^2}\right)^{n-1} c_3 (y_3 - y_1) + \left(\frac{\omega^2}{\omega_4^2}\right)^{n-1} c_4 (y_4 - y_1) + \dots \quad (4)
 \end{aligned}$$

$$\begin{aligned}
 {}_n y'_{b2} &= \left(\frac{\omega^2}{\omega_2^2}\right)^n y_{a2} \\
 &\quad - \left(\frac{\omega^2}{\omega_2^2}\right)^n \left[ \left(\frac{\omega_2^2}{\omega_1^2} - 1\right) + \left(\frac{\omega_2^2}{\omega_3^2}\right)^n \left(\frac{\omega_3^2}{\omega_1^2} - 1\right) c_3 + \left(\frac{\omega_2^2}{\omega_4^2}\right)^n \left(\frac{\omega_4^2}{\omega_1^2} - 1\right) c_4 + \dots \right] y_1 \\
 &\quad + \left(\frac{\omega^2}{\omega_3^2}\right)^n c_3 (y_3 - y_1) + \left(\frac{\omega^2}{\omega_4^2}\right)^n c_4 (y_4 - y_1) + \dots \quad (5)
 \end{aligned}$$

$$\begin{aligned}
 {}_n y'_{a2} &= [{}_n y'_{b2} - y_1({}_n y'_{b2})_A] \\
 &= \left(\frac{\omega^2}{\omega_2^2}\right)^n y_{a2} + \left(\frac{\omega^2}{\omega_3^2}\right)^n c_3 (y_3 - y_1) + \left(\frac{\omega^2}{\omega_4^2}\right)^n c_4 (y_4 - y_1) + \dots \quad (6)
 \end{aligned}$$

Equations (4) and (6) show that under the normal distribution of frequencies ( $\omega_1 < \omega_2 < \omega_3 < \dots$ ) the procedure leads to the determination of the second natural frequency and the transformed second mode shape. Thus

$$\lim_{n \rightarrow \infty} \frac{{}_n y_{a2}}{{}_n y'_{a2}} = \frac{\omega_2^2}{\omega^2} \quad (7)$$

and

$$\lim_{\substack{n \rightarrow \infty \\ \omega = \omega_2}} {}_n y'_{a2} = y_{a2} \quad (8)$$

The second natural mode is given in the limit by a combination of the sweeping function and equation (8) as follows:

$$\lim_{\substack{n \rightarrow \infty \\ \omega = \omega_2}} [-y_1({}_n y'_{b2})_A] = \left(\frac{\omega_2^2}{\omega_1^2} - 1\right) y_1 \quad (9)$$

$$y_2 = y_{a2} + y_1 = \lim_{\substack{n \rightarrow \infty \\ \omega = \omega_2}} \left[ {}_n y'_{a2} - \frac{y_1({}_n y'_{b2})_A}{\left(\frac{\omega_2^2}{\omega_1^2} - 1\right)} \right] \quad (10)$$

Cases of multiple frequencies and nearly equal frequencies are given special consideration in the thesis.

The thesis extends this basic procedure to the determination of modes and frequencies higher than the second. The transformed third mode, for example, is defined and determined as that linear combination of the first natural mode, the transformed second mode, and the third natural mode, which has zero ordinates at two stations, A and B, station A being



being the same as in the determination of the transformed second mode.

### Conclusions

The iterative transformation procedure makes possible a straightforward determination of natural modes and frequencies with greater simplicity and accuracy than iterative methods now in use. The process gives transformed modes from which natural modes are easily computed.

The nature of the transformed modes is such that their nodal locations are under the control of the computer. This gives rise to the development of sweeping operations that are consistently more accurate and simpler to use than the more commonly used sweeping operations which are founded upon orthogonality relations. These new sweeping methods involve only addition of mode shapes and avoid the integration of products of modes required in other methods.

The procedure is naturally adapted to numerical work that employs a station coordinate system (as contrasted with generalized coordinates). The accuracy of the numerical calculations for continuous systems is maintained at a high level with reduced effort by incorporation of a concept of equivalent concentrations previously given by Newmark and by other techniques which have been developed specifically in connection with the numerical examples of the thesis.

The resolution of arbitrary functions into natural mode components through the use of transformed modes may be performed with simplifications similar to those made possible in the determination of the natural modes by the iterative transformation procedure.

Microfilm copy of complete manuscript of 136 pages, \$1.70. Enlargements 6" x 8", 10¢ per page. Library of Congress card number MicA54-459.

### ANALYSIS OF PRESSURE SURGES IN LONG PIPE LINES DUE TO GRADUAL STOPPAGE OF FLOW

(Publication No. 7006)

Joseph Louis Krahula, Ph.D.  
University of Illinois, 1952

The objective of this paper is to develop a general solution for one case of transient flow, namely the evaluation of the pressure-distance-time relations existing along a semi-infinite pipe line after uniform stoppage of flow within the time  $t_0$  seconds. The analysis is for a semi-infinite pipe line so that no reflection of the pressure waves is considered. However, a corresponding analysis for a finite line is also discussed. The pipe line is considered to be horizontal, the motion within the pipe as one dimensional, and the velocity of flow over a cross section as constant. Laplace transformation is used to develop the laminar flow case whereas the method of characteristics is utilized to solve the non-linear case of turbulent flow. It was found at a later stage

of this work that the method of characteristics can also be used to solve the laminar flow case with much less time and effort. The advantages of the method of characteristics are indicated. The results are expressed in a form of four graphs, two for laminar flow and two for turbulent flow. The quantities (pressure-distance-time) plotted are in dimensionless ratios so that the curves can be used for a problem of uniform closure of a valve for any pipe line. The case of the suddenly closed valve has already been solved by M. Ludwig using the same dimensionless form of the basic differential equations of liquid flow as that adopted by the author. His curves are also included in this paper.

Microfilm copy of complete manuscript of 53 pages, \$1.00. Enlargements 6" x 8", 10¢ per page. Library of Congress card number MicA54-460.

### PLASTIC BENDING OF CIRCULAR PLATES SYMMETRICALLY LOADED

(Publication No. 6904)

Kenneth Ring Merckx, Ph.D.  
Stanford University, 1953

Because materials are often stressed into the plastic range in lightweight construction, a need exists for information concerning the plastic behavior of structural members. A plate subjected to lateral loads is such a structural member. In this thesis, we use several general methods of plasticity to obtain information about the plastic behavior of circular plates and we suggest how these methods can be extended to rectangular plates.

In this thesis, the kinematic relations connecting the displacements of the neutral surface to the strains are those of the small deflection theory of bending. The stress-strain relations are those of the theory of plastic deformations (secant modulus theory). In the last chapter, the comparison of the theory of plastic flow and the theory of plastic deformations indicates that only slight differences would be found in numerical results calculated by either of these two theories.

The four approximate methods which are applied to circular plates are

1. Sokolovsky's Method,
2. Iteration Method,
3. Potential Energy Method,
4. Complementary Potential Energy Method.

Sokolovsky reduces the equations relating the moments, curvatures, and loads of the plate to two simultaneous first order non-linear differential equations. These equations are then solved by numerical integration. The iteration method, developed by Ilyushin, is adapted for the bending of circular plates. In this method we separate a non-linear second order differential equation into a linear portion and a non-linear portion. The effect of the non-linear portion on the solution is found by the iteration procedure. The principle

of minimum potential energy is used to estimate the circumferential curvature of the plate by means of functions containing arbitrary parameters. These parameters are evaluated by Galerkin's Method. The principle of minimum complementary potential energy is used to estimate the radial bending moment in the plate by a similar process.

Numerical results are obtained by all four methods for a simply supported uniformly loaded plate for a material where the second stress invariant  $S$  is related to the second strain invariant  $E$  by

$$S = 2G (1 - \lambda E^2) E.$$

A comparison of the results of the above method is given in the last chapter of this thesis. These results include graphs of the deflection, circumferential curvature, and radial bending moment for circular plates which have reached one-half the maximum and the maximum strain condition at the center of the plate. The results are given in terms of dimensionless parameters; thus, these results can be used for various materials and size of plates. Also, in this chapter, the last three of the above approximate methods are developed for rectangular plates, but no numerical calculations are made.

Microfilm copy of complete manuscript of 89 pages, \$1.11. Enlargements 6" x 8", 10¢ per page. Library of Congress card number MicA54-461.

#### ELASTIC STABILITY OF CONICAL SHELLS LOADED BY UNIFORM EXTERNAL PRESSURE

(Publication No. 6988)

Charles Edwin Taylor, Ph.D.  
University of Illinois, 1953

In 1933 E. Trefftz developed a general theory of elastic stability that is well suited for the study of buckling of shells. This theory is used to determine the external hydrostatic pressure that will cause a thin conical shell to buckle.

It is assumed that normals to the undeformed middle surface remain straight and normal to the deformed middle surface, and that changes in the shell thickness have negligible effects on the strains in surfaces parallel to the middle surface. It is also assumed that stresses perpendicular to the middle surface of the shell are negligible compared to the other stresses.

Novozhilov has shown recently in his "Foundations of the Non-linear Theory of Elasticity" that these approximations are valid provided that the normal strains and the shearing strains are negligible in comparison with rotations of particles of the shell in determining the directions of fibers of the strained shell.

With the above set of assumptions, strain expressions are derived which are exact through quadratic terms in the components of the virtual displacement vector and its derivatives. Through the use of these expressions, a strain-energy expression is derived.

The potential energy of the external forces equals the product of the external hydrostatic pressure and the increase of volume. The divergence theorem is

used to express the volume enclosed by the deformed middle surface in terms of a surface integral.

An upper bound for the critical pressure for a complete conical shell with a simply supported base is obtained by the Rayleigh-Ritz method. The resulting equations are very long and complex. However by comparison of orders of magnitude, many terms may be shown to have negligible effects, and the equations can be simplified greatly with little loss in accuracy.

Microfilm copy of complete manuscript of 48 pages, \$1.00. Enlargements 6" x 8", 10¢ per page. Library of Congress card number MicA54-462.

#### ANALYSIS OF TOROIDAL SHELLS

(Publication No. 7069)

Robert J. Timms, Ph.D.  
Northwestern University, 1953

In this dissertation, a general analytical solution is developed for the determination of stresses and displacements in toroidal shells of circular cross-section, subjected to an axially symmetrical system of forces and moments around the edges and distributed pressures over the surface of the shell. The solution was attained by the same method of asymptotic integration used by previous investigators of this subject, with the exception that now fewer restrictions were made. As a result of this, it becomes possible to include quite flat shell segments, which occur most frequently in practice and which were outside of the range of previous approximations.

The use of the above analytical approach was illustrated by numerical examples on a variety of shell ratios and loading conditions. Particular attention was given to shell segments which are restrained at both edges against rotation and radial displacements, since it is segments of this type from which welded bellows are constructed, and which form the most important field of application of this theory. Though the above method provides a complete analysis of shells of this type, by making certain practical approximations it was found possible to establish simple formulas for the maximum stress and deflections occurring under axial edge loads and distributed pressures, which should be of considerable aid to designers.

The analytical work was complemented by model tests, and the experimentally derived stress and deflection values were found in very satisfactory agreement with the calculated values.

Though the subject of this dissertation was limited to toroidal shells the cross section of which is one circular arc, the experience gained in this work indicates clearly that the same method of approach could be successfully applied to more complex problems of this nature, such as diaphragms with multiple corrugations and shells of variable curvature.

Microfilm copy of complete manuscript of 185 pages, \$2.31. Enlargements 6" x 8", 10¢ per page. Library of Congress card number MicA54-463.



## FOOD TECHNOLOGY

### SWEET CORN DEHYDRATION: THE FALLING-RATE PHASE

(Publication No. 6945)

Richard Gordon Garner, Ph.D.  
University of Illinois, 1953

A study has been made of the dehydration characteristics of partially dried Golden Cross hybrid sweet corn in the falling-rate phase ( $T = 0.5$  to  $T = 0.05$ ). Apparatus employed consisted of a through-circulation pilot plant drier with sufficient flexibility of control to give a wide range of dehydrating conditions.

Preliminary experiments on the effects of air temperature, 110 to 180° F.; relative humidity 5 to 25%; air velocity, 50 to 250 feet per minute; bed depth, 2 to 8 inches; and on reproducibility determined the principal factors and established the experimental procedure. Periodic vacuum oven moisture determinations were utilized to follow the rate of drying. Static pressure drop through the bed was measured both on dry and wet corn samples.

Correlation of drying conditions with product quality retention was tested by means of soluble color, density, organoleptic and rehydration tests. The water soluble color method was employed most effectively in evaluating effects of heat damage on the acceptability of the dehydrated material.

Results indicate that drying air temperature and bed depth were the principal dehydration variables having an effect upon drying rate in the range of moisture ratios studied. Air velocity and humidity were found to have only slight effects.

Equilibrium moisture-relative humidity relations for sweet corn in the range of 0 to 35% relative humidity were determined and shown to be of importance when very low final moisture contents were desired.

Increasing the drying air temperature was demonstrated to markedly increase the drying rate in the falling-rate phase. However, excessive drying temperatures resulted in heat damage to the product.

The effects of bed depth or tray loading on drying time and output rate were determined. Maximum output of  $T = 0.15$  corn was obtained with the deepest bed. Excessive bed depth necessitated prolonged drying time and resulted in heat damage to surface layer of product.

Product quality was shown to be the controlling factor in the selection of optimum dehydrating conditions. Soluble color determinations, visual observations and organoleptic testing indicated that excessive drying temperatures resulted in product damage. These findings also suggest that it is possible to incur 'incipient' heat damage during the course of dehydration even though it may not be visually apparent at the conclusion of the drying run.

Stage drying is suggested as a means of integrating maximum drying rate with optimum quality retention. Proposed limits for the respective stages are given.

The bearing of these results on drier design are discussed.

Microfilm copy of complete manuscript of 86 pages, \$1.08. Enlargements 6" x 8", 10¢ per page. Library of Congress card number MicA54-464.

### EFFECT OF HARVESTING CONDITIONS ON MOLD COUNT OF BLACK RASPBERRIES

(Publication No. 6855)

Kuchibhatla Lakshmi Narasimham, Ph.D.  
Michigan State College, 1953

A study was made to determine various factors that might influence the mold count of processed black raspberries in Michigan during the seasons of 1951 and 1952. Effects of different stages of maturity of berries harvested at different intervals after rains, shaking the black raspberry bushes before harvesting the fruit, holding wet and dry berries for different intervals before processing and subjecting the berries to various water-pressure washings were studied. The relationship between various dilution methods and mold count in berries was also determined. The berries were carefully harvested to prevent any mechanical injury. They were frozen at the factories and brought to Michigan State College for further examination.

The frozen black raspberries were thawed by keeping the cans containing them in a vessel holding boiling-hot water. After thawing, the samples were pulped by a laboratory pulper with screen openings of 0.027 inch in diameter. One part of black raspberry pulp obtained as above was diluted with two parts by weight of 3 per cent pectin solution. The pulped berry samples were examined for mold filaments by the modified procedure of the official mold-count method.

Soft ripe black raspberries were found to have higher mold counts than any other stage of maturity, and seemed to be responsible for the higher mold counts of the composite samples. Highly significant differences between maturity stages and a definite increase in the mold count with time following rainfall were observed, indicating that weather conditions play an important role in influencing the mold count of berries. Highly significant reduction of mold count in berries was obtained by shaking the black raspberry bushes before harvesting the fruit. The berries of Logan variety had higher mold counts than those of the Cumberland variety at all stages of maturity except the shiny-black stage.

The time that elapses between harvesting the berries and processing them was found to have a great effect on the mold count of the final product.

A significant increase in the mold count of the berries and a high correlation between holding time and the number of molds in berries were found. No significant difference between holding the wet and dry berries was observed in this study.

Washing seemed to be effective in reducing the mold count of berries. Black raspberries subjected to water washing by shaker washer, water spray on the conveyor belt, and sink washing with thorough agitation of the fruit was found to be the most effective method for reducing the mold count.

No significant differences were obtained when mold counts determined by modified technique were compared with those obtained by the official method. Adding different amounts of pectin solution to black raspberry pulp lowered the mold count, but its decrease was not in direct proportion to the amounts of pectin solution added.

Microfilm copy of complete manuscript of 99 pages, \$1.24. Enlargements 6" x 8", 10¢ per page. Library of Congress card number MicA54-465.

## GEOGRAPHY

### THE TEMUCO REGION, A GEOGRAPHIC STUDY IN SOUTH CENTRAL CHILE

(Publication No. 6934)

David John de Laubenfels, Ph.D.  
University of Illinois, 1953

A region in South Central Chile has been described in order to contribute to the geographic knowledge of that area. This region, called here the "Temuco Region," is differentiated from the surrounding area by distinct qualities of unity which include both dynamic organization and static uniformity. The Region is not, however, either distinct in all ways from the surrounding area or characterized by complete internal unity. The description of the Temuco Region therefore includes a discussion of the setting of that Region and of the distinctive areas within the Region, as well as of the regional character.

The Temuco Region is a part of a larger area, Central Chile, which has several broad characteristics. Central Chile is isolated from the rest of the world by barriers of landform and climate, and differs from surrounding areas by having seasonal rainfall. Central Chile is long from north to south. The eastern side of this area is made up of the Andes Mountains and the western side by the Coast Range hills. Between these hills and mountains is the Great Valley of Chile where most of Chile's population is concentrated. People and land use are rather uniform within Central Chile.

The Temuco Region has as its node the city of Temuco. This city is the focus of a structure of transportation routes which connect it to all parts of the Region. Operating out of Temuco are many commercial agents who in large measure control the movement to market of the production of the Region. A significant number of the Region's farm operators themselves live in Temuco. The nodal quality of Temuco is also shown by the concentration in that city of population and the location there of retail, industrial, and educational activities in greater amounts in proportion to population than characterizes the rest of the Region.

In addition to Temuco, there are various lesser centers in the overall structure of the Temuco Region. There are nine secondary cities, similar, in a small way, to Temuco, but differing in the increased relative importance of the physical assembly of regional production.<sup>1</sup> Next in importance are the many towns which serve primarily as shipping points for local produce. The smallest centers in the regional structure are fundo (estate) headquarters area.

Besides internal organizational unity, there are several uniform qualities which characterize the Temuco Region. The Region consists of a continuous area of level to rolling topography surrounded on all sides by physical barriers to human activity. Within this area there has been in recent times a uniform history of settlement. Corresponding to this same area is a zone of dry cool summers. Grapes, beans, lentils, and corn are excluded from the Region because they do not mature properly in cool summers, and the planting of wheat and oats is thus encouraged, while to the south, wet summers even discourage these last two crops. Corresponding roughly to the same climatic zone is the best development of two of the most important lumber trees of Chile, roble and araucaria.

Differences occur from place to place within the Temuco Region by which it can be divided into distinctive areas. Urban areas differ from the rest of the Region in concentration of population and all that that implies. Four distinctive rural areas were identified; being roughly the northwest, the northeast, the southeast, and the southwest. These four areas have been given names which reflect their most distinctive character. The four are called respectively: The Dry Plateau, the High Plateau, the Glaciated Mountain Border, and the Mapuche Stronghold.

Microfilm copy of complete manuscript of 268 pages, \$3.35. Enlargements 6" x 8", 10¢ per page. Library of Congress card number MicA54-466.



**TERRE HAUTE, INDIANA:  
A CITY OF NON-GROWTH**

(Publication No. 7027)

Robert Roland Drummond, Ph.D.  
Northwestern University, 1953

According to the Census for 1950, Terre Haute, Indiana with a population of 64,214 has become a city of non-growth. Since 1920, its population has declined 2.9 per cent. This stands in sharp contrast to the 59.7 per cent increase of 15 Midwest cities of equal size.

This study has four purposes: (1) to investigate the city's historical development in order to ascertain the causes of non-growth; (2) to reconstruct the geography of Terre Haute for the years 1920 and 1950 in order to determine the effects of non-growth upon its structure and function; (3) to determine the extent and nature of the Terre Haute City-Region for the years 1920 and 1950 so that the changes in the regional influence of the city can be evaluated; and (4) to formulate a number of hypotheses concerning non-growing cities.

The geography of the city in 1920 was reconstructed from the 1920 Census reports and a detailed city directory. Land-use maps were constructed from these and other minor sources. The Terre Haute City-Region of 1920 was determined by the extent of newspaper circulation, institutional influence, size of the trade area and the extent of the transportation network. Population patterns and production levels were determined from Census reports.

The geographical character of the city and its region for 1950 was ascertained through field work and the published reports of the 1950 Census. The extent and character of the Region were determined by the same criteria as in 1920 except that the radio broadcast area was added.

Three paramount reasons explain the non-growth phenomenon of Terre Haute: (1) following World War I, Terre Haute was subjected to a series of industrial and social upheavals which substantially altered its economic base; (2) irresponsible leadership plagued the city during the 1920's and 1930's; (3) due partly to these causes, Terre Haute did not benefit from the movement of rural people to urban areas after 1920.

Changes in Terre Haute which can be attributed to non-growth include: (1) cessation of areal growth; (2) a faster decline in the male population and in the young as compared to the female population and the aged than in Indiana cities of comparable size; (3) a more rapid increase in employment of women than in other comparable cities in the Midwest; (4) few locational changes of functional activities within the city; (5) a decline in family size.

The areal extent of the City-Region has changed only slightly since 1920. However, there is a greater coincidence of the present delimiting boundaries.

Hypotheses concerning a non-growing city derived from this study suggest that: (1) control be established over areas beyond city boundaries; (2) only limited areas be reserved for future commercial, industrial and terminal facilities; (3) a positive program be

initiated for expansion of parks and other public facilities while competition for the land is slight; (4) balance be sought between new industries which will make use of surplus labor and those which will use the raw materials of the city's region; (5) only those industries which will maintain a balanced occupational structure be encouraged; (6) close supervision over smoke, odors, and commercial waste be established, if new citizens are to be attracted; (7) cooperation between labor and capital be close; (8) remodeling of dwellings be stringently regulated; finally (9) problems attending growth and expansion tend to disappear, and the city is free to concentrate on improving the life of its citizens.

Microfilm copy of complete manuscript of 505 pages, \$6.31. Enlargements 6" x 8", 10¢ per page. Library of Congress card number MicA54-467.

**A STUDY OF THE AGRICULTURE AND  
RURAL SETTLEMENT PATTERN OF  
VIGO COUNTY, INDIANA,  
WITH EMPHASIS ON THE  
IMPACT OF STRIP COAL MINING**

(Publication No. 7036)

James Lee Guernsey, Ph.D.  
Northwestern University, 1953

Vigo County, Indiana is an example of an area which has declined in acreage of land in farms and number of farmers in recent decades. From 1900 to 1932, these declines were similar to those throughout most of the north-central states. Since 1932, changes in the agriculture and rural settlements have been more conspicuous than in most areas because about 5,000 acres of the county's farmland have been strip mined for coal.

The purpose of the study is to survey and measure quantitatively, where possible, otherwise qualitatively, the geographic distribution and changes in the agriculture and rural settlement pattern of Vigo County. The study was undertaken in order to (1) inventory the agriculture prior to strip mining, (2) depict the rural settlement pattern prior to strip mining, (3) trace the development of strip mining, (4) determine recent changes in the agriculture with emphasis on the impact of strip mining, (5) determine recent changes in the rural settlement pattern with emphasis on the impact of strip mining, and (6) evaluate the impact of strip mining on the agriculture and rural settlement pattern of Vigo County.

Data obtained and used in the dissertation consist of both quantitative and qualitative types. Quantitative data were obtained from the United States Census reports, Purdue University Agricultural reports, County Court House records, the County Agricultural Agent's files, and the Indiana Coal Producers Association's files. Qualitative data were gathered from materials in newspapers, magazines, scientific journals, bulletins, annual reports, and other printed matter about Vigo County. Most basic data, however,

were obtained from maps, aerial photographs, field mapping, and field interviews.

It was determined that changes in the agriculture and rural settlement pattern of Vigo County prior to 1932 were similar to comparable areas throughout the north-central states. Since 1932, strip mining has markedly altered the agriculture and rural settlement pattern in twenty-seven sections of Vigo County. As a result the number of farms, acreage of land in farms, and acreage of cultivated crops all declined more in the townships where strip mining has occurred than in the other townships of Vigo County. Agricultural employment has been reduced by strip mining because the acreage of agricultural land has decreased and fewer coal miners are required in coal production. Since 1932, land ownership in areas of stripping has changed in four main ways: (1) part owners have increased their holdings; (2) farm tenancy has been reduced; (3) coal mining companies have become large land owners; and (4) tax delinquent land has been reduced.

Rural settlements have changed more in the areas of strip mining than in other parts of Vigo County. In the areas of strip mining, rural settlements have changed in the following ways: (1) the number of individual farms has decreased 29 per cent; (2) the fields have become smaller and more irregularly shaped; (3) the number of semi-rural settlements has increased 1.4 times; (4) the number of semi-urban dwellings has increased three fold; and (5) the mileage of high quality roads has increased.

The study will be useful: (1) specifically to rural residents and leaders in Vigo County and to various public and private agencies functioning there; (2) generally to similar groups in other counties where strip mining has occurred; and (3) as a criteria for other comparable studies. If comparable studies are carried out in other areas of strip mining, it will be possible to generalize and work out an index of findings so that they can be made widely usable.

Microfilm copy of complete manuscript of 213 pages, \$2.66. Enlargements 6" x 8", 10¢ per page. Library of Congress card number MicA54-468.

#### CLIMATE AND CLIMATIC REGIONS OF WESTERN CANADA

(Publication No. 6977)

George Alfred Rheumer, Ph.D.  
University of Illinois, 1953

#### Objectives

This study represents the first attempt to map, analyse, and synthesize, in detail, the climates of western Canada. In addition, a sensitive index of climatic differences is offered through the application of the climatic year concept<sup>1</sup> to western Canada. Thus the data are presented in a more usable form, and a trial of a method for the delimitation of nuclear and transitional climates in a high latitude and mountainous areas is attempted.

#### Procedure

Since thirty-five years is considered adequate for the examination of climatic data, an analysis of temperature and precipitation was made from October, 1916, through September, 1951. Many stations within western Canada, however, have not recorded data continuously through this thirty-five year period. These stations were used subject to self-imposed limitations of length and period of recording. They serve to augment the longer records and also to indicate possible limits of climatic phenomena where otherwise there would be a void.

Three exceptions to the Köppen classification combine to make the study unique. First, because winter is the dominant season in Canada, the year has been divided at the end of September, thus utilizing a seasonal rather than the calendar year used by Köppen and Russell.<sup>2</sup> Secondly, the boundary between C and D climates has been set at 32° F. for the coldest month, in accordance with the procedure proposed by Richard Joel Russell and followed by others. Finally, the climatic year concept of establishing frequency of climatic occurrence within a given number of years has been followed instead of using average condition for the period.

#### Conclusions

The climatic year concept represents a step away from the limitations which are inherent in the Köppen classification. Although limited by some of the weaknesses of the Köppen system, it does recognize the importance of extreme conditions in an area, and thus shows climatic regions more true to type. It also demonstrates the variability and frequency of climatic occurrence. In addition, nuclear climates are more readily recognized and are set closer to their proper perspective.

In a mountainous area such as British Columbia and Western Alberta, the climatic year concept of classification represents a more desirable method of delimiting climates because it can more easily recognize minute differences which are lost when the Köppen system is applied. In addition, some of the results of the effects of the intricacies of slope, exposure and elevation are recognized.

The climatic year classification has two outstanding characteristics which combine to make it equal, or superior to, other classifications so far devised to classify the climates of western Canada. First, it presents a very detailed picture of the climates based upon existing data, and secondly, the system may be applied to any existing system, or possibly to any forthcoming means of classification which is based upon either or both qualitative or quantitative synthesis of climatic controls.

1. Richard Joel Russell, "Climatic Years," *Geographical Review*, XXIV (January, 1934), 92-103.

2. *Ibid.*

Microfilm copy of complete manuscript of 276 pages, \$3.45. Enlargements 6" x 8", 10¢ per page. Library of Congress card number MicA54-469.



THE CONTRIBUTIONS OF  
ALEXANDER VON HUMBOLDT  
TO THE SCIENCE AND STUDY  
OF PHYSICAL GEOGRAPHY

(Publication No. 7117)

Marie Antoinette Soscie, Ph.D.  
New York University, 1953

The purpose of the investigator in pursuing the study of "The Contributions of Alexander von Humboldt to the Science and Study of Physical Geography" is to indicate the origin and development of the study of physical geography as a science and to indicate to what degree Alexander von Humboldt assisted in its development.

During the last twenty-five years there has been a steady increase in the number of classes devoted to the study of physical geography. In New York City alone the increase in the number of classes in physical geography is particularly evident. It is noteworthy, also, that many schools which did not include physical geography in their original curricula have now made way for this subject. Physical geography is a dynamic subject. It offers many fields of exploration. A study of its origin and development is merited.

A survey shows that pre-nineteenth century geographic publications were comparatively few and stressed mathematical geography and astronomy. Explanations lacked scientific status as they were based in part on superstition, hearsay, poor observations, and inaccurate instruments. There was little attempt at systematizing the data collected. Illustrations were few. Maps, for local areas as well as for newly-explored regions, were to a considerable degree inaccurate.

The physical geographies of the nineteenth century underwent a marked metamorphosis. There resulted radical changes in content, development, emphasis, and approach to the subject. In addition to chapters on astronomy and mathematical geography, there were included chapters on morphological changes resulting from catastrophic movements, topographic modifications resulting from the action of various agents of weathering and erosion, oceanography, meteorology and climatology, vulcanology and seismology, and paleontology.

Alexander von Humboldt is often referred to as

the "second discovered of America" and is one of the founders of the science of Physical Geography. He was greatly responsible for many of the changes wrought and the many areas of development of the subject. Subsequent to and influenced by his contributions we find included in physical geographies: the composition of the air, the relation of temperature to increased altitude, the rate of change in pressure with increased altitude, geologic cross-sections, maps showing the linear distribution of volcanoes in association with earthquake zones, and the relation between the distribution of plant life with increasing altitude and latitude.

Because of Humboldt's graphic and original means of representing natural phenomena, present-day publications are profuse with illustrations of various kinds. Isothermal charts, profiles, cross-sections, graphs of different types initiated by Humboldt greatly simplified the study of physical geography.

Humboldt's avowed aim in his life-long study of natural phenomena was not only to formulate natural laws but also to apply them for the benefit of mankind. The formulation of many natural laws concerning physical geography as expressed by Humboldt raised the subject to a scientific level. Its study no longer aimed at the mere accumulation of facts and memorization of data but at their interpretation and influence on the progress of civilization. Natural laws evolved from a better understanding of Physical Geography as we recognize it today are applied to studies involving weather forecasting, flood control, land conservation, fuel reserves, irrigation, and navigation.

Alexander von Humboldt's original contributions in the fields of climatology and meteorology, vulcanology and seismology, geology, magnetism, stratigraphy, paleontology, and botany; in graphic representations; in the proper scientific evaluation of data and his insistence on the utilization of correct data; have elevated the study of physical geography to a scientific plane and influenced the manner in which the subject is developed. All these have established Humboldt's name among the most famous in the field of physical geography.

Microfilm copy of complete manuscript of 159 pages, \$1.99. Enlargements 6" x 8", 10¢ per page. Library of Congress card number MicA54-470.

## GEOLOGY

### SAND DISTRIBUTION IN THE CYPRESS FORMATION, CLAY COUNTY AND VICINITY, ILLINOIS

(Publication No. 6925)

John Judson Chapman, Ph.D.  
University of Illinois, 1953

This paper contains the results of an electric log study of the Cypress formation in Clay County and vicinity, Illinois. The formation is separated into three phases corresponding to each of the three main sands in the section. Statistical diagrams based on a section by section measurement of the linear directions of each sand, as shown on the isopachous maps, are included. Several small cross sections of linear bodies in each sand, as well as four regional cross sections, were constructed. A litho-facies map based on the distribution of sand, sandy shale and shale in the upper three feet of the formation is also included.

The massive basal sand forms a blanket deposit over most of the area. Superimposed on this blanket are numerous northwest trending linear sand bodies and several shorter northeast trending bodies. The same linear features are repeated in the middle sand, to a lesser degree. The blanket sand is missing and the northwest trending sand features are concentrated into broad bands. The northeast trending bodies are poorly developed. The upper sand is the most restricted in distribution of the three. The northwest direction of elongation predominates.

The cause of the sand features present in the formation is not known. It is believed that deposition took place in a gradually shoaling marine environment with dry land being present in the region toward the end of the interval. Features suggestive of such diverse environments of deposition as deltas, tidal lagoons and open seas are all present, but are not conclusive enough to warrant a decision as to the cause. It is doubtful if a single environment prevailed throughout the entire formation.

Microfilm copy of complete manuscript of 74 pages, \$1.00. Enlargements 6" x 8", 10¢ per page. Library of Congress card number MicA54-471.

### GEOLOGY OF THE STANFORD RANGE, BRITISH COLUMBIA

(Publication No. 6812)

Gerald Gordon Lewis Henderson, Ph.D.  
Princeton University, 1953

The Stanford Range forms part of a separate structural sub-province of the Rocky Mountains. Within this sub-province the stratigraphy and structure are distinct from those of the rest of the Rocky Mountains.

The stratigraphy of the Stanford Range is characterized by a greatly reduced Cambrian section, the presence of a very thick Ordovician, Silurian, and Middle Devonian succession, and the complete absence of lithified rocks younger than Middle Devonian. The normal succession is dominated by carbonates and contains a very thick gypsum formation which is between Middle Silurian and Middle Devonian in age.

The structures of the Stanford Range are complex and like those of the rest of the sub-province are overturned and inclined toward the southwest; this is in direct contrast to the northeasterly overturning in the Purcell Mountains and the remainder of the Rocky Mountains. Two major longitudinal faults divide the Stanford Range into three fault blocks, each of which is characterized by a distinct set of structures. In the western of these, localized longitudinal foreshortening of the range has occurred — this is indicative of large strike slip movement on the western longitudinal fault. Stratigraphic evidence indicates that similar strike slip movements occurred also on the eastern longitudinal fault.

The regional geology of the western and main ranges of the Rocky Mountains at this latitude is discussed. Particular emphasis is given to the White River Break which is the name proposed for the major fault zone that separates the western sub-province from the main ranges of the Rocky Mountains. This break is characterized by a wide zone of shearing along which a remarkable calcareous, chloritic schist is developed. The White River Break appears to be a southwest-dipping thrust. The main ranges of the Rocky Mountains, composed mostly of flat lying Precambrian and Cambrian rocks, are believed to be a major wedge uplift.

Extremely large deposits of commercial gypsum occur in large graben blocks at several localities within the Stanford Range. The gypsum is in the form of finely laminated rock gypsum and all evidence indicates that it is primary. Some new chemical data are presented relating to the stability relationships between gypsum and anhydrite as functions of temperature and pressure. Under average thermal conditions gypsum appears to be metastable at depths below 3,500 feet and in the presence of a water solution should be converted to anhydrite. In the presence of a salt solution transformation should occur at shallower depths. The primary character of the Stanford Range gypsum therefore suggests that the deposits have never been more deeply buried than they are at the present time.

Microfilm copy of complete manuscript of 221 pages, \$2.76. Enlargements 6" x 8", 10¢ per page. Library of Congress card number MicA54-472.



**SEDIMENTARY-STRATIGRAPHIC ANALYSIS  
OF THE OFICINA SEDIMENTS,  
GREATER OFICINA, VENEZUELA**

(Publication No. 7060)

David Arthur Probst, Ph.D.  
Northwestern University, 1953

The purpose of this study is to investigate the regional sedimentary-stratigraphic variations in a portion of Tertiary rocks in eastern Venezuela. The area discussed lies in the central portion of the Greater Oficina Area, State of Anzoategui, Venezuela. The Oficina section, of Oligocene-Miocene age, includes approximately fifty productive oil sands. Twenty-five members of this section were studied in detail. The members selected for study were chosen at approximately one hundred foot intervals. Semi-regional base maps were first constructed on scale 1:50,000 and subsequently reduced to scale 1:250,000. Facies patterns are outlined by numbers and letters on various plates and a discussion of these features constitutes a major part of the thesis. By semi-regional is meant a study which lies between broad, regional analyses of an entire section and local field studies of a particular area. The analysis is based on one-half kilometer control and was designed primarily to examine the potentialities of such a method of analysis.

The sedimentary patterns are outlined solely from an analysis of electric logs inasmuch as direct measurements of the physical parameters from cores were not possible during the course of this study. The term "facies" is, therefore, used only to differentiate the various shale, sand-shale, and sand developments portrayed by the maps.

The Oficina sediments are underlain by Cretaceous Temblador sediments and are overlain by the Freites shale of Miocene age. The Oficina section itself is composed of a cyclic series of sandstones and shales deposited in lagoonal to shallow neritic environments. Thin lenses of limestone and sheets of lignite occur throughout the section. Many of these lenses have very widespread areal extent and, in many instances, form valuable regional correlation markers. Their areal distributions are shown on the various plates accompanying the thesis.

An essential part of the study was an attempt to interpret and reconstruct the environments of sedimentation. Toward this end, air photographs of various areas of western and eastern Venezuela were critically examined and comparisons made with the patterns of sedimentation observed in the Oficina sediments. An analysis was made of the phenomena of cyclic sedimentation and stratigraphic lensing insofar as these criteria influence the sedimentary patterns. Finally, the tectono-environmental aspects of the Oficina group were analyzed and inferences made relative to the paleogeography of the area.

Microfilm copy of complete manuscript of 190 pages, \$2.38. Enlargements 6" x 8", 10¢ per page. Library of Congress card number MicA54-473.

**THE WHITE CREEK BATHOLITH  
AND ITS GEOLOGICAL ENVIRONMENT  
IN DEWAR CREEK MAP-AREA,  
BRITISH COLUMBIA**

(Publication No. 6831)

John Elgin Reesor, Ph.D.  
Princeton University, 1952

Dewar Creek map-area covers 385 square miles in the Purcell Range of southeastern British Columbia; one-half underlain by White Creek batholith, one-half by not less than 30,000 feet of fine grained clastics of Lower Purcell Series. These rocks are recrystallized and but little deformed in the eastern part of the area; metamorphosed to phyllites and deformed into isoclinal folds in the west.

White Creek batholith has been intruded into the above assemblage resulting in much further deformation and metamorphism. Granitic rock types include quartz monzonite of the interior, and mafic-rich granodiorite of the border zones. This variety of rock types is believed due to contamination of the original magma, possibly resulting in mutual reaction between contaminated and non-contaminated magmas. Further, the origin of widespread phenocrysts of microcline and of the inclusions is considered.

On the basis of internal structure and relation to external structures, the batholith is considered to have been forcefully intruded. Side-thrusting and vertical upward motion are shown to have taken place.

Microfilm copy of complete manuscript of 169 pages, \$2.11. Enlargements 6" x 8", 10¢ per page. Library of Congress card number MicA54-474.

**GEOLOGY OF THE  
PUERTECITO QUADRANGLE,  
SOCORRO COUNTY, NEW MEXICO**

(Publication No. 6843)

William H. Tonking, Ph.D.  
Princeton University, 1953

The Puertecito quadrangle, west-central New Mexico, consists of sedimentary, volcanic, and intrusive rocks. The sedimentary series contains Permian, Triassic, Cretaceous and Tertiary rocks. The volcanic rocks, which underlie the synclinal Bear Mountains and the eastern foothills of the Gallina Mountains in the mapped area are of late Miocene (?) age. Dikes and sills of syenodiorite mainly intrude Permian strata whereas basaltic dikes, sills, and plugs primarily cut post-Permian strata and intrude rocks

as young as the upper part of the late Miocene (?) volcanic sequence.

The late Miocene (?) volcanics, the Datil formation, are subdivided into three members: (1) the lower member, the Spears member, composed of quartz latite tuff, agglomerate, breccia, and volcanic sandstone and conglomerate; (2) the middle member, the Hells Mesa member, made up of welded and "semi-welded" rhyolite tuff; (3) the upper member, the La Jara Peak member, composed of flows and flow breccias of basalt in the lower portions and basaltic andesite in the upper part. The composition change in the La Jara Peak member is readily explained by fractionation in the magma chamber.

At least two periods of deformation took place in the quadrangle. The first orogeny, which occurred in late Cretaceous or early Tertiary time, consisted essentially of eastward-directed forces and is responsible for the formation of the La Cruz anticline and the Sierra Lucero Uplift. The basal portions of the Baca formation are interpreted as of synorogenic origin for they were folded with older beds during this deformation. The second orogeny took place in late Miocene (?) time before the cessation of volcanism. Normal faulting with a large horizontal component of movement resulted from this deformation which apparently consisted of a couple directed in an east-southeast and west-northwest direction. Dike swarms trend about N 10 W parallel to the major trend of the faults and were intruded slightly before the faulting. The Santa Fe formation, which overlies the Datil formation, has not been faulted or intruded.

Detailed petrographic work is correlated with six chemical analyses that were made of the igneous rocks. Artificial glasses were prepared and the refractive indices plotted against the percentage of silica in the chemical analyses. These data indicate that the syenodiorite intrusions are non-consanguineous with the extrusions and the basaltic dikes. Application of this "silica-refractive index" curve to non-analysed, petrographically similar rocks several miles west of the quadrangle suggests that the volcanic rocks of the Gallina Mountains are chemically similar to those of the Bear Mountains.

Several stratigraphic sections were measured and are shown in the appendix.

Microfilm copy of complete manuscript of 173 pages, \$2.16. Enlargements 6" x 8", 10¢ per page. Library of Congress card number MicA54-475.

#### OLIGOCENE AND EARLY MIOCENE NIMRAVIDS OF NORTH AMERICA

(Publication No. 6844)

Loren Milton Toohey, Ph.D.  
Princeton University, 1953

The history of the stratigraphical terminology is discussed for the Oligocene deposits in South Dakota

and Nebraska. The names *Titanotherium*, *Oreodon*, and *Leptauchenia* zones are useful but the actual ranges of genera are not known and probably never will be known. Redefinitions based on subsequent discoveries expand or contract generic and specific ranges, and names may be changed through synonymy. The application of geographic names of formational or member status to the South Dakota deposits would clarify some of the existing problems. The authors who use the term 'zone' or 'beds' recognize a greyish-white ash layer as the top of the *Leptauchenia* zone or beds, but remains of *Leptauchenia* are abundant throughout the sediments 200 or more feet above this ash.

Recognition of *Nimravus brachyops* as the genotypic species, and A.M.N.H. 6939 as the lectotype, requires a complete change in the concept of the generic name. *Pogonodon* is a synonym of *Nimravus*. All known examples referable to this genus have been examined. Additional material from the Oligocene deposits indicates the close relationship of *Nimravus* to *Dinictis*.

Subsequent to the description of *Archaelurus debilis* six very similar species and one subspecies have been described from the late Oligocene and early Miocene deposits of North America. At present there appears to be no evidence to support the recognition of more than one species of *Archaelurus*. All known specimens and holotypes referable to this genus have been examined. The forms included under *A. debilis*, as herein used, may be considered to represent a chronocline. Subspecific treatment of this chronocline is at present inadvisable because of a subspecific homonym which would occur.

The unique bilateral structure on the external alveolar border (post. P /4-M /1) of *Archaelurus* has received at least four different names; and is herein called, to avoid any genetic implications, the alveolar torus. Although the size of the torus varies among individuals, the pattern of its development is correlated with individual age and geological time. It is smaller in the less mature and geologically older individuals and, conversely, larger in the more adult and geologically younger individuals. No function can, as yet, be ascribed to the torus. It has been considered as an insertion area for a muscle, as a structure which might strengthen the jaw, and as a pathological condition. The interpretation favored at present is that this structure and two others in *A. debilis* are the results of a single mutant gene.

The concepts formed as a results of the present study do not permit *Archaelurus* (*Nimravus* of others) to be considered as the ancestral stock for *Pseudaelurus*.

Microfilm copy of complete manuscript of 142 pages, \$1.78. Enlargements 6" x 8", 10¢ per page. Library of Congress card number MicA54-476.



## HEALTH SCIENCES

### HEALTH SCIENCES, GENERAL

#### ABSENCE DUE TO ILLNESS IN THE ELEMENTARY SCHOOLS, REDWOOD CITY, CALIFORNIA

(Publication No. 6879)

Ralph Mason, Ed.D.  
Stanford University, 1953

The purpose of this study was to discover the cause of absence due to illness in the elementary school and to relate these absences to length of absence, school month, sex of pupils, and grade level.

Data used in this study were extracted from Verification of Absence Due to Illness Form No. J-31, the California State Department of Education form used to record absence due to illness. There were 13,113 cases representing the total absences due to illness of 3,252 pupils in five elementary schools in Redwood City, California during the 1949-1950 school year.

#### Incidence and Severity of Illness

The rank order, from high to low, of incidence of illness and accidents causing absence from school was found to be:

1. Respiratory illness
2. Digestive diseases and disturbances
3. Organic and functional disorders
4. Injuries and accidents
5. Other medical causes (No specific illness noted in the verification of absence)
6. Other communicable diseases
7. Skin conditions
8. Organic diseases.

The rank order, from high to low, of degree of severity of illness or accidents was found to be:

1. Respiratory illness
2. Other communicable diseases
3. Digestive diseases and disturbances
4. Organic and functional disorders
5. Accidents and injuries
6. Other medical causes
7. Organic diseases
8. Skin conditions.

#### School Month and Absence Due to Illness

1. January had the highest incidence of all types of illness. September had the lowest incidence.
2. Respiratory illness had the highest rate of incidence for each school month. December, January, and February were the peak months for respiratory illness.
3. May had the highest incidence of other communicable diseases.

4. Injuries and accidents had a fairly consistent monthly rate during the school year. A slight decrease in the rate was observed during the fall and winter months.

5. Organic and functional disorders showed a gradual monthly increase throughout the school year.

6. There was no monthly trend noted for skin conditions, organic diseases, or other medical causes.

#### Sex of Pupils and Absence Due to Illness

1. Girls had a higher frequency of absences due to illness than boys for respiratory illnesses, other communicable diseases, digestive diseases and disturbances, and organic and functional disorders.

2. Boys had a higher frequency of injuries and accidents.

3. There were no differences noted for absence due to organic diseases, skin conditions, and other medical causes.

4. Girls evidenced a higher severity rate for the respiratory illnesses with the exception of pneumonia.

5. Girls had a higher severity rate for whooping cough and chickenpox while boys had a higher severity rate for measles and scarlet fever.

6. Severity rates for digestive diseases and disturbances were slightly higher for boys.

7. Girls had a higher severity rate for organic diseases and injuries and accidents causing absences from school.

8. There were no sex differences in severity noted for organic and functional disorders or for absence due to other medical causes.

#### Incidence of Illness and Grade Level

The rank of order of grades from high to low for incidence of illness was:

- |                 |                            |
|-----------------|----------------------------|
| 1. Kindergarten | 5. Third grade             |
| 2. First grade  | 6. Fifth and eighth grades |
| 3. Second grade | 7. Sixth grade             |
| 4. Fourth grade | 8. Seventh grade           |

The primary grades had the highest incidence of respiratory illness and other communicable diseases.

The rate for digestive diseases and disturbances was highest at the fourth grade.

The eighth grade had the highest rate for injuries and accidents.

The primary grades had the highest rate for organic diseases.

Grade level trends for organic and functional disorders and other medical causes were not noted.

#### Implications for School Health

Absence due to illness records may be used as a supplementary technique for the appraisal of the health status of pupils, as an aid to curriculum development, and as a means of increasing awareness to school health problems.

Microfilm copy of complete manuscript of 135 pages, \$1.69. Enlargements 6" x 8", 10¢ per page. Library of Congress card number MicA54-477.

# HEALTH SCIENCES, HYGIENE

## INDIVIDUAL DIFFERENCES IN BLOOD PRESSURES IN ONE THOUSAND COLLEGE MEN

(Publication No. 6872)

Guido Oscar de Ghetaldi, Jr., Ed.D.  
Stanford University, 1953

This study of blood pressures in one thousand college men correlated blood pressure with height, weight, age, carious teeth, postural and weight deviations. The term "blood pressure" included systolic, diastolic, and pulse pressures, and data were taken from the medical records of college physical examinations. An attempt was made to find criteria for

the early recognition of impending essential hypertension in this age group (mean 22.65 years) with the prompt institution of preventive measures.

Previous studies of high blood pressure have shown the causes advanced range from "effects of civilization" to "chronic infections" with the authors agreeing mainly on overweight and renal pathology. Other specific causes include effects of emotional tension, tumors of the adrenal glands, foci of infection such as abscessed teeth and infected tonsils, disturbances of the pituitary gland and the central nervous system, and increased salt intake. Significant points brought out in previous studies show that systolic pressure is more susceptible to environmental and emotional factors and that there is some suggestion that persons having hypertension at the age of 40 had it at the age of 20. Hypertension is usually a long term disease having its genesis at an early age.

To obtain the correlation for this study, the "scatter gram" method was used. The actual computation of the coefficient of correlation ( $r$ ) was obtained through the use of the Pearson product moment correlation coefficient.

The results of the study are given in the following tables:

Table 23  
SUMMARY OF THE CORRELATIONS OF SYSTOLIC PRESSURE WITH OTHER MEASURES

Variable	$r$	Confidence limits for $\hat{r}$	Critical ratio	Probability figure
Diastolic	$0.427 \pm 0.025$	0.492 and 0.357	13.33	<0.00003
Pulse Pressure	$0.859 \pm 0.008$	0.879 and 0.836	26.84	<0.00003
Height	$0.090 \pm 0.031$	0.179 and 0.015	2.81	0.005
Weight	$0.147 \pm 0.031$	0.227 and 0.065	4.60	<0.00003
Age	$0.004 \pm 0.032$	0.087 and -0.079	0.133	0.900
Carious Teeth	$0.053 \pm 0.032$	0.135 and -0.050	1.66	0.098
Posture	$0.019 \pm 0.032$	0.102 and -0.064	0.590	0.580
Weight Deviation	$0.045 \pm 0.032$	0.128 and -0.038	1.407	0.158

Table 24  
SUMMARY OF THE CORRELATIONS OF DIASTOLIC PRESSURE WITH OTHER MEASURES

Variable	$r$	Confidence limits for $\hat{r}$	Critical ratio	Probability figure
Pulse Pressure	$0.018 \pm 0.032$	0.101 and -0.065	0.559	0.595
Height	$0.042 \pm 0.032$	0.124 and -0.041	1.309	0.190
Weight	$0.041 \pm 0.032$	0.123 and -0.042	1.284	0.204
Age	$0.017 \pm 0.032$	0.100 and -0.066	0.543	0.581
Carious Teeth	$0.009 \pm 0.032$	0.092 and -0.074	0.293	0.770
Posture	$-0.011 \pm 0.032$	0.072 and -0.094	-0.337	0.073
Weight Deviation	$-0.016 \pm 0.032$	0.067 and -0.099	-0.050	0.980

Table 25  
SUMMARY OF THE CORRELATIONS OF PULSE PRESSURE WITH OTHER MEASURES

Variable	$r$	Confidence limits for $\hat{r}$	Critical ratio	Probability figure
Height	$0.058 \pm 0.032$	0.140 and -0.127	1.800	0.071
Weight	$0.125 \pm 0.031$	0.198 and 0.043	3.906	0.00008
Age	$0.038 \pm 0.032$	0.120 and -0.045	1.193	0.301
Carious Teeth	$0.077 \pm 0.031$	0.159 and -0.006	2.406	0.016
Posture	$0.008 \pm 0.032$	0.091 and -0.075	0.246	0.802
Weight Deviation	$0.061 \pm 0.032$	0.144 and -0.022	1.907	0.057



Those coefficients of correlation which show definite significance are systolic pressure with diastolic pressure with a  $r$  of 0.427 and a critical ratio of 13.33 and systolic pressure with pulse pressure with a  $r$  of 0.859 and a critical ratio of 26.84. Systolic pressure correlated with weight yields a value of 0.147 with a critical ratio of 4.60 showing some significance. Pulse pressure correlated with weight with a value of 0.125 and a critical ratio of 3.906 shows some relation which would be consistent with the fact that systolic pressure rises first in early hypertension.

In conclusion, there is no significant correlation between blood pressure and the various physical deviations used in this study, with the possible exception of weight, where a correlation of systolic pressure and pulse pressure with weight showed some significance.

Microfilm copy of complete manuscript of 84 pages, \$1.05. Enlargements 6" x 8", 10¢ per page. Library of Congress card number MicA54-478.

#### METHODS FOR TEACHING HEALTH EDUCATION

(Publication No. 6873)

Bruce Lyn Hubbard, Ed.D.  
Stanford University, 1953

The need for health education has long been recognized at all levels of learning and in all fields of endeavor. This need, stated simply in terms of objectives, is for the acquiring of significant health information and appropriate experiences upon which desirable health attitudes, interests, and practices can be developed. To satisfy the need and to achieve the objectives, health instruction must utilize methods which are known to be effective.

Research concerned with methods for teaching health education has been both meager and inconclusive. The effectiveness of methods currently in use for increasing health knowledge, for influencing health attitudes, and for improving health practices is relatively unknown. Accordingly, the purpose of this study is to provide experimental evaluation of the effectiveness of three different methods for teaching health education in a junior college.

The methods selected for evaluation were: (1) The lecture method, (2) a method employing various teaching techniques which require active student participation, and (3) a combination of these methods with emphasis upon class discussion. In conjunction with the lecture method a college hygiene textbook was used which not only provided the major portion of the material upon which the lectures were based, but served as a guide for the course of study to be followed. The major purpose of the lectures was to clarify points in question and to emphasize the material particularly relevant to the students' interests and problems.

For the class in which use was made of methods which require active student participation the following

techniques were employed: Sociodrama, problem-solving, buzz sessions, self-tests, games, student-conducted surveys and interviews, student-selected speakers, student reports, and various audio-visual aids. No specific textbook was used. Instead, a list of selected references was provided. Every effort was made to avoid formal and autocratic class organization. The selection of both the materials and the methods to be used was made by the students with a minimum of guidance from the instructor and was based upon the interests and problems of the group.

The combination method combined the lecture method with the following teaching techniques: Sociodrama, a student-conducted survey, a student-written play, guest speakers, and audio-visual aids. Class discussion was constantly encouraged. A textbook was used in conjunction with the method as a basic reference only and not as a guide for the course of study. The course of study followed the major health problem areas identified in a health interest inventory with emphasis given to the students' interests and problems.

The study was conducted with the use of three sections of students enrolled in hygiene as organized in a junior college through the usual registration procedure. No effort of any kind was made to equate or match the groups. Since evaluation was to be made in terms of the objectives to be achieved, the groups were pre-tested with a health knowledge test, a health attitude scale, and a health practice inventory. At the conclusion of the courses of study all three groups were re-tested with the same measuring instruments used for the pre-tests.

In order to secure comparable precision from the use of statistical controls that would have been secured had the groups been matched or equated, the method of analysis of covariance was used for the statistical analysis of the initial and final test scores attained by the different groups. Tests of significance were then applied to determine whether or not the differences between absolute mean gains made by each group were significant.

From this study it was concluded that all three methods were effective to some extent in achieving the objectives of health education. Furthermore, they were as effective as most methods currently used in California junior colleges so far as health knowledge is concerned according to available norms. The observed differences between absolute gains made with the use of these methods could reasonably be attributed to chance factors and, hence, were not significant.

Microfilm copy of complete manuscript of 171 pages, \$2.14. Enlargements 6" x 8", 10¢ per page. Library of Congress card number MicA54-479.

## HEALTH SCIENCES, PATHOLOGY

THE DISTRIBUTIONS OF THE DUFFY, KELL,  
KIDD, LEWIS AND S(MN) BLOOD FACTORS  
OF THE AMERICAN NEGROES,  
WITH FAMILY STUDY  
AND STATISTICAL ANALYSIS

(Publication No. 7059)

Somsak Phansomboon, Ph.D.  
Northwestern University, 1953

It is shown that blood groups, when properly applied, has gained itself a place in anthropology. It has the advantage that the blood groups of any person can readily and accurately be determined. However, it should be borne in mind that the importance of blood grouping has its limits. Thus, whereas certain physical characters, such as the black skin and curly hair of the Negroes, evidently indicate the racial derivation of an individual, the presence of a particular blood group or groups does not belong exclusively to any race. That is to say, blood grouping cannot be used as an aid in determining the racial derivation or origin of single individual; it can be of significance only when a relatively large number of individuals of the same race or tribes is studied and analyzed by statistical methods.

The second disadvantage of the application of blood groups to anthropology is that, on one hand, people of the same race may have widely different frequency distributions, whereas, on the other hand, entirely unrelated races may have a similar serological composition. However, blood grouping has a distinct and undeniable advantage in that there is no selection of matings regarding one's own blood group, and this has the tendency to make the blood factor distributions of a given race to remain at a constant level from generation to generation, unless there is immigration and interbreeding of one race with the others; another advantage of it is that it is not affected by disease or environment. Even when there

is intermarriage, it is still possible to estimate with considerable accuracy the amount of interbreeding.

Studies on the racial distributions of the A-B-O system have already been made on almost every race in the world. Further studies on the frequency distribution of the Rh factor have yielded additional and important information to the anthropologists.

The present study is destined to work out the gene frequency distributions of the Duffy, Kell-Cellano, Kidd, Lewis and S systems in the American Negroes and to show the inheritance of them in forty two families, supported by statistical analysis and employing, in most cases, the Binomial theorem.

The important findings are:

(1) In the Duffy system, the colored peoples have a  $Fy(a+)$  gene frequency of 13.1 per cent which is about three times less than that of the Whites.

(2) The American Negroes possess a  $K+$  gene frequency of 1.5 per cent in contrast to the white population (5.2 per cent).

(3) With regard to the Kidd system, the Negroes have a  $Jk(a+)$  gene frequency of 75.4 per cent, about one half time more than the Whites.

(4) There is little difference in the gene frequency of the Lewis system in the two populations.

(5) Family studies and statistical analysis illustrate well that the Duffy, Kell, Kidd and S systems are inherited as dominant Mendelian characters.

(6) The Lewis blood factor, in contrary to all other known blood group genes, is inherited as a recessive Mendelian character.

At the present time, little can be said about the anthropological application of these gene frequencies in the study of mankind; but when additional data are available for comparison from other countries, the percentage figures recorded here will certainly be of immense value in the bioserological classification of mankind.

Microfilm copy of complete manuscript of 57 pages, \$1.00. Enlargements 6" x 8", 10¢ per page. Library of Congress card number MicA54-480.



## HISTORY

### HISTORY, GENERAL

#### PUBLIC OPINION AS A FACTOR IN THE EMERGENCE OF A NATIONAL ANTI-TRUST PROGRAM, 1873-1890

(Publication No. 7099)

Sanford Daniel Gordon, Ph.D.  
New York University, 1953

#### The Problem:

This study has been designed to show the influence of public opinion during the period 1873 to 1890 on the making of a national anti-trust policy. More specifically, the investigator has sought to study the influence of public opinion as one factor in the total social environment producing the Sherman Anti-Trust Act.

#### Delimitations:

This study is confined to the years 1873 to 1890. Railroad and utility combinations were omitted.

#### Scope of Sources:

Sources included all articles dealing with "trusts," "monopolies," "combinations," and "pools," in the *New York Times*; articles mentioned in the index of the *New York Tribune*; articles and books listed in a bibliography on these subjects prepared by the United States Library of Congress; articles, pamphlets, and books mentioned in the card files of the New York Public Library, Columbia University Library, New York University Library, and the New York State Library in Albany; items on the subjects mentioned above in the *Congressional Record*; articles in the magazine *Public Opinion*, as well as in specialized journals in law, industry, labor, and agriculture; published during the period of this study.

#### Methodology:

The problems which monopolistic practices presented during the period 1873 to 1890 were identified from the sources examined. The reaction of the public to these problems and towards the movement of industrial combinations was treated chronologically to show the increase of public hostility towards industrial combinations and the growing demand for government action. All sources were examined for proposed solutions to the identified problems. Twenty-one different solutions were presented. Each solution was examined to determine acceptability to the public and Congress during the period. Those solutions found acceptable were checked to see which of them found their way into the Sherman Anti-Trust Act and which were by-passed by Congress. An attempt was made to determine why Congress ignored this latter group.

#### General outcomes:

(1) The problems which monopolistic practices presented during the period. (2) The history of the reaction to the movement of industrial combinations during the period. (3) Solutions to the problems presented during the period. (4) Which solutions the public and Congress accepted considering their popularity and agreement with the basic values found in the social milieu of the period.

#### Conclusions:

(1) Problems of monopolistic practices were pointed out by the Anti-Monopoly party before the movement of industrial combinations started. (2) Industrial combinations became a National and political problem when they were referred to in Cleveland's tariff message in December, 1887. From this time on Congress and the various media of public opinion demanded that industrial combinations be destroyed. (3) The Democratic party, seeking tariff reform, identified the two problems, the tariff and "trusts," together. With few exceptions the public, as expressed through the various media of public opinion, felt that suspension of duties on articles produced by combinations would be the most effective solution in destroying most combinations. (4) The Republican party, committed to protection, denied any relation between the tariff and "trusts," for fear that any concession made on the tariff would destroy their major objective — protection. (5) The almost unanimous vote for the passage of the Serman Anti-Trust Act reflected the degree of public hostility towards combinations. The debate in Congress over the bill and the small amount of favorable response to the passage of the bill by the organs of public opinion indicated the lack of faith in the solution adopted.

Microfilm copy of complete manuscript of 421 pages, \$5.26. Enlargements 6" x 8", 10¢ per page. Library of Congress card number MicA54-481.

### HISTORY, MODERN

#### MATTHIAS ERZBERGER AND GERMAN POLITICS, 1914-1921

(Publication No. 6893)

Bruce Bradford Frye, Ph.D.  
Stanford University, 1953

In August 1921, there occurred the assassination of one of the most controversial figures in German political life, the leader of the Catholic Center Party, Matthias Erzberger. Erzberger

played a crucial role in several significant events in German History: the colonial scandals of 1906-1907, the July Crisis of 1917, the acceptance of the armistice and the Treaty of Versailles, and the 1919 financial reform law.

Erzberger entered the Reichstag in 1903 at the age of twenty-eight and by 1914 he had reached the summit of a Reichstag deputy's power. His ownership of a Catholic news agency, his facile pen, his unusual oratorical ability secured a place for him in the Centrist Reichstag *Fraktion* which he won by his industry and intelligence. He was ruthlessly ambitious and served the Right dutifully before the war. He was never completely amenable, however, and his undoubted democratic proclivities and occasional violent attacks on the fetishes of the conservative-nationalists offset his service to government and the military.

Erzberger's political career was made possible by the peculiar nature of the Center party. In the years before the war the party's left wing, under the leadership of Erzberger, grew in power and self-consciousness commensurable to its electoral strength. To retain its popularity the party was forced to cooperate with the Left to gain domestic reforms. To secure its clerical objectives, however, and in questions of foreign affairs, it cooperated with the Right. The war strained this contradiction, but led by Erzberger, the most supple of politicians, the party was equal to its anomalous position. With a foot in each camp, the Center Party stood at the parliamentary balance prepared to shift its weight in the direction which secured its continuance as a clerical party. When Erzberger exploited several streams of discontent to provoke the July Crisis in 1917 he goaded the party left and formed a new parliamentary majority in cooperation with the Left dedicated to moderate war aims and to parliamentary reform.

After July 1917, Erzberger was personally associated by the conservative-nationalists with the socialists and the Jews — the black-red-gold "November criminals." He was labeled the "grave-digger of the Reich" and the "destroyer of the Reich" for his role in the acceptance of the armistice and the Treaty of Versailles and in urging financial reforms to implement the policy of fulfillment which he publicly urged. Although he was forced to the political sidelines by damaging revelations concerning his personal affairs in February 1920, he was preparing for a return to the political arena when he was struck down by hirelings of the Right and enemies of the republic.

Erzberger had grave deficiencies which barred him from gaining respect from Germany's most influential classes. His father had been a tailor and he himself had had only a *Volksschule* education in a nation where advanced degrees were common in politics, the expert was revered and the dilettante scorned. He was vain and grasping, indiscreet and impetuous. Yet in the final years of his political career he exhibited great moral courage.

Erzberger's policy of close cooperation with socialism and "liberalism" in many ways anticipated the more conciliatory policies of the Christian

Democratic parties after 1945. His career promised to make something different of the Center party than a clerical party directed by conservatives. While it is a moot question whether the existence of a clerical party was necessary following 1919, a Center Party devoted to the ideals of liberal government would have been a stronger pillar for the republic than the party which developed after Erzberger's death.

Microfilm copy of complete manuscript of 356 pages, \$4.45. Enlargements 6" x 8", 10¢ per page. Library of Congress card number MicA54-482.

CHARLES-LOUIS DE SAULCES  
DE FREYCINET AND THE ARMY  
OF METROPOLITAN FRANCE — 1870-1918:  
A STUDY IN THE POLITICS  
OF MILITARY SECURITY

(Publication No. 6820)

Edward Lawrence Katzenbach, Jr., Ph.D.  
Princeton University, 1953

This dissertation covers M. de Freycinet's association with military affairs over a period of half a century. It begins with a study of military theory in a period immediately preceding the War of 1870 so that the war itself, and particularly the War in the Provinces, can be understood in the perspective of time. It studies M. de Freycinet's role in the War in the Provinces as Gambetta's delegate at the Ministry of War. It concludes that his role was greater than is generally recognized.

After the war Freycinet was the military writer for Gambetta's *République française* and chief apologist for the conduct of the War in the Provinces. The changes which took place, and did not take place, in Republican military theory after their late disastrous experience with war in practice are duly noted. Likewise the theories of the Right on the causes of defeat are studied in some detail to show how the dichotomy of thought set up at the beginning of the dissertation survived the experience of the double defeat of 1870 — that of Napoleon's professional army on the one hand and that of the Republican *levée en masse* on the other.

The central section of the dissertation is devoted to M. de Freycinet's activities, first as a member of the Senate Military Committee after his election to that body in 1876, and then as the first civilian Minister of War in the Third French Republic. It discusses in detail the reasons why he was given the position and why it was that he was able to hold the position longer than any other Minister of War during the period discussed. The author contends that M. de Freycinet was the greatest of the French War Ministers. He speaks of various measures which Freycinet took to insure a strong Republican army. Because the importance of the reserve component is the central theme of Republican military philosophy, a great



deal of detail is given on the organization of the reserves and the plans made for their use. Because the concept of the reserves is based on a firm belief in the efficacy of the military principle of mass, the relation between Freycinet's military premises and the eagerness with which he sought an alliance with the Russians during his period as Minister of War is analyzed.

After Freycinet's retirement from the Ministry of War in 1893, he was again called back to power during the Dreyfus Affair. The role of Freycinet in the Case, and his attempted solution of it are reviewed.

Because M. de Freycinet resumed his role as President of the Senate Military Committee immediately after the affair, he continued to be important in military circles. It was he who was responsible for the passage of the two-year service Bill in 1905. He was still President of the Committee when the Bill of 1913 was passed. It is the author's thesis that, aside from being an excellent and forceful administrator, M. de Freycinet tended to spin like a weather-vane with each puff of public opinion. The author contends further that in a democracy the public creates its army in its own image. Hence much of the chapters on the Bills of 1889, 1905, and 1913 deal with the currents of popular thought on military affairs. There is a final brief chapter on Freycinet's ephemeral role during the First World War.

The entire thesis is oriented around the conflicting theories of those who believe in professional armies and those who rely on the reserve. The author is interested not only in the content of the theories, which, after all, is well-known, but also in what made the one more popular than the other at a given moment in the history of the Third French Republic. He also deals with the problem of coordinating Republican political philosophy with an army philosophy which opposed to it, and with the concomitant problem of controlling the undemocratic elements of the army within framework of a democratic form of government.

Because this dissertation has a political orientation, the bulk of the materials which were used came from magazines, newspapers, and debates. However, the author was the first to be given access to the only extant papers of M. de Freycinet in the library of the École Polytechnique in Paris. The chapter on the role of Freycinet in the War in the Provinces has been documented with the five volumes of his dispatches which were found in this collection. Certain other individual pieces, particularly fragments of unpublished works, were of great value, and have been duly utilized.

It should be noted that this is the only known major study of M. de Freycinet in any capacity.

Microfilm copy of complete manuscript of 692 pages, \$8.65. Enlargements 6" x 8", 10¢ per page. Library of Congress card number MicA54-483.

## JOSE VASCONCELOS AND THE MEXICAN REVOLUTION OF 1910

(Publication No. 6908)

Richard Baker Phillips, Ph.D.  
Stanford University, 1953

More than forty years ago, Mexico experienced the first in a series of upheavals out of which came chaos and then reform. The resulting chain of events is called the Revolution of 1910. Like others before them, the generation that matured in the first decade of the twentieth century was schooled in the tenets of Positivism; but, unlike its predecessors, it educated itself in the cultures of Greece and Spain and the prevailing trends of contemporaneous Europe. Known as the Generation of the Ateneo, these young Mexicans instituted a cultural and intellectual reform that preceded the political uprisings which began in 1910.

José Vasconcelos was prominent in several phases of the Revolution. Once an outspoken Liberal, he has become increasingly Conservative. As a philosopher, Vasconcelos has been subject of some study; but as a revolutionary, he has been neglected. Hence, this search was undertaken to examine Vasconcelos' varied contributions to the Revolution of 1910 and to seek an explanation for his withdrawal from the progressive forces of Mexico.

Vasconcelos studied law only because it promised an income. He hoped that a thriving practice would early make him financially independent so that he could devote all his time to literary and philosophical pursuits. However, he could not resist becoming involved in the unsettled political life of Mexico after 1910.

In 1920, Vasconcelos received a political appointment as president of the National University. From there, he began his reforms that gave a completely new orientation to Mexican education. He established the Ministry of Education with a secretary of Cabinet rank. As Obregón's Secretary of Education, Vasconcelos performed his greatest service to the Mexican nation.

The new Ministry had three divisions: 1) The Department of Schools, 2) The Department of Libraries and Archives, and 3) The Department of Fine Arts. The threefold division was an important feature in the eyes of Vasconcelos, and has in large part been retained. Vasconcelos' driving energy and constructive leadership gave Mexico an educational system for which John Dewey expressed admiration a few years after Vasconcelos had left the Ministry.

Vasconcelos made two attempts to win public office in Mexico and failed at both. The most popular of the presidential candidates of 1929, he followed Francisco Madero's pattern for instigating revolt and taking power, but this attempt, unlike Madero's, ended unsuccessfully.

Apart from philosophy, his thinking on sociology and politics has occasioned considerable comment. He once wrote of a "cosmic race," the final miscegenation of all blood of Hispanic America.

Although physically of all the races, culturally the Cosmic Race would have to be Spanish and Catholic.

Vasconcelos' increasing interest in Catholicism has taken him from the ranks of the Liberals. He now judges whether a government is good or bad by its actions toward the Catholic Church. He is convinced of a conspiracy of Liberal elements which he calls an "international maffia," to destroy Catholicism and the Spanish heritage. Thus Liberal governments which harm the Church or curb its activities in any way do not attract his sympathies.

He is now a hater of both Communism and Capitalism. The two must eventually be destroyed, to be replaced by a Christian Socialism, or to change the emphasis, a Social Christianity. Vasconcelos is no longer considered friendly to Democracy.

This is briefly the story of a man who served under the banners of the Mexican Revolution of 1910, but who has turned sharply from the path it has now taken.

Microfilm copy of complete manuscript of 345 pages, \$4.31. Enlargements 6" x 8", 10¢ per page. Library of Congress card number MicA54-484.

#### THE REFORM OF SUFFRAGE AND REPRESENTATION IN NEW JERSEY: 1774— 1844

(Publication No. 6829)

Jack Richon Pole, Ph.D.  
Princeton University, 1953

In 1844 New Jersey held a constitutional convention at which universal white manhood suffrage was officially introduced (with minor exceptions). But the main principles involved were not disputed and hardly even debated. Legislation and local practice had brought in the suffrage before the state constitution.

The fundamental step towards suffrage extension had been taken as early as 1776, when the Provincial Congress dropped the freehold tenure qualification and limited suffrage requirements to fifty pounds personal estate in proclamation money. This development resulted from two principal factors: first, a stream of petitions from East Jersey, and second, the fact that the Congress, with no independent army or administration, depended on the cooperation of county and township committees which represented their local communities. Suffrage extension lay in the practical logic of the political situation. The remaining qualifications were swept away in the subsequent inflation. After the decline of the inflation, suffrage is not under debate. By the 1790's, election statistics show a high proportion of the white male population frequently voting. No legislation to extend the suffrage had taken place since the Revolution, leading to the inference that the Revolutionary Legislation was considered to have established the right. In the meantime, however, the place of voting had been changed from county court house to township, not as a

result of a concerted movement, but piecemeal, county by county until the General Township Act of 1797. This year was followed by a marked increase in participation in elections. The importance of this practical extension of the facilities for voting must be considered hardly less great than that of the constitutional right, especially under early conditions of transport.

Party organization was affected by two new factors: the U.S. Constitution made it necessary to elect a Congressional delegation from the state as a whole (previously appointed by the legislature); and the township polling made it necessary to have nominations in advance of the elections; previously all could go to the court house on election day. The Republican took better advantage than the Federalists of these new conditions. The Federalists objected to standing political associations and denounced both the methods and purposes of the Republicans. Nevertheless, Federalist writers accepted the basis of the Republic and urged all voters to vote. They did not advocate suffrage restriction. Qualifications for membership of the legislature were higher than for the suffrage, and the Republicans themselves failed to challenge this system, although they introduced popular election of presidential electors in 1804.

Politics languished in the Era of Good Feelings, and when activity was renewed in the Jackson period, a wide suffrage basis already existed. The problem for parties now was how to bring out the vote. Representational questions such as county representation, electoral districts and election laws, while hotly debated, were made a matter of party politics. Party organisation developed with the growth of press, posts and transport and with an increasing professionalisation of politics.

The new constitution of 1844, established after over fifty years of unsuccessful attempts at reform, incorporated the advances that had been made by legislation and local practice almost throughout the life of the old Revolutionary constitution of the state.

Microfilm copy of complete manuscript of 303 pages, \$3.79. Enlargements 6" x 8", 10¢ per page. Library of Congress card number MicA54-485.

#### ZWINGLIANISM IN ENGLAND DURING THE REIGN OF ELIZABETH

(Publication No. 6909)

Melvyn Eugene Pratt, Jr., Ph.D.  
Stanford University, 1953

The accession of Mary to the throne of England threatened to obliterate the influence of Zwinglianism which, though firmly established at the court of Edward VI and successful in transforming the theology and practice of the Church of England, had not won the hearts of the people. During her reign, however, many of the top



Protestant leaders, both clerical and lay, found their way to Zwinglian centers on the continent where their ties with the movement were strengthened.

Among the exiles began the struggle between the Zwinglians and the Calvinists over the use of the Prayer Book. Their two systems were closely allied and had reached theological agreement in the Consensus of 1549, but its terms did not extend to the fields of church government and liturgy. On the continent there had been no necessity for it because the practice of the two groups was similar, but when transplanted to England, the differences were brought into sharp contrast and the ensuing years were marked by a growing struggle.

Under Elizabeth the Zwinglians were given the advantage, partly because of their previous ascendancy and partly because of their adaptability to the English scene, while the Calvinists were purposely ignored. The Zwinglian reforms, established during the reign of Edward, were legally restored. In addition, the government of the church was turned almost entirely to members of their party. They found also that the persecutions of the intervening years had given them a degree of popular support for which they had not dared hope. Only the queen seemed to stand in the way of the complete evolution of Zwinglianism in England.

Because of her attitude and because of the difference of outlook between those Zwinglians who had remained in England and those who had been subjected to the puritanism of the continent, a split developed among the Zwinglians themselves. Under Parker it became quite manifest, but concessions temporarily satisfied those Zwinglians who made up the bulk of the puritan party. The puritan group continued to grow and to press for further reform, however, partly as a result of the hesitancy of the government and the moderate faction to proceed with reform and partly because of their basic concept of the Elizabethan settlement as a temporary and imperfect expedient. This attitude, coupled with their indifference to questions of church government, made them possible allies of the Calvinist puritans and increased both the threat and the power of that group at times when Zwinglian party unity was not maintained.

Archbishop Parker, though attaining a certain degree of success with the aid of the Zwinglian divines at Zurich and of the puritans leaders at home, was not sufficiently able to distinguish between the demands of the moderate puritans and the more extreme ones of the Calvinists. Grindal attempted unity on the basis of the concepts of his Zwinglian puritan faction which had resulted from the exile. His efforts, however, were halted by the queen before they were amply tried and a period resulted in which matters were allowed to take their course and unity was all but lost. Whitgift, partly through concession but mainly by force, was able to maintain at least a formal unity of the Zwinglian party, but not able to attain unity of thought.

Out of Whitgift's moderate Zwinglian Faction grew the Anglican party, determined to defend the status quo and thus subject to conservative influence.

Out of Grindal's puritan Zwinglian faction, intent on progressing reform, developed that great body of puritans which though dissatisfied with many elements of the established church remained within its bounds as long as possible.

Microfilm copy of complete manuscript of 349 pages, \$4.36. Enlargements 6" x 8", 10¢ per page. Library of Congress card number MicA54-486.

## THE ORIGINS OF THE MOUVEMENT RÉPUBLICAIN POPULAIRE

(Publication No. 7078)

Kathryn Roberta Street, Ph.D.  
Bryn Mawr College, 1953

This study of the "Origins of the Mouvement Républicain Populaire" is an attempt to explain the sudden appearance of the MRP as one of the major parties in post-war France, and to provide some indication of its nature. Three major topics are discussed: (1) the development of an extensive Christian Democratic movement in the years prior to 1940; (2) the effect of the Resistance movement on the French political situation; and (3) the organization of the Mouvement Républicain Populaire as a new medium for political action.

The pre-war Christian Democratic movement developed all of the elements necessary for successful political action. Though it fell short of establishing a strong party on a national scale itself, its contributions to the Mouvement Républicain Populaire in the form of program and doctrine were extensive, and it provided a reservoir of militants and experienced leaders for the new party.

The events of the war years produced a new set of conditions; they favored the emergence of a mass party of Christian Democratic inspiration by breaking down old political and religious prejudices. When the Liberation came, young Christian Democrats were to be found as accepted leaders of the metropolitan Resistance and as responsible officials of the Provisional Government.

The MRP was established in 1944 and 1945 with the assistance of militants who came to it from the Catholic associations and from the Resistance movement. They created a firm party structure and set forth a program stressing economic democracy and political liberty. Since the voters who supported it without conviction in the first post-war elections have deserted it, the MRP has become smaller, but stronger.

The MRP now represents that portion of the French people whose religious beliefs are real and whose convictions regarding economic and political democracy are strong. This group, which had never really attained recognition under the system of the Third Republic, is an important part of the nation. It is as a spokesman for it that the Mouvement Républicain Populaire can look forward to a continuing and useful career.

Microfilm copy of complete manuscript of 212 pages, \$2.65. Enlargements 6" x 8", 10¢ per page. Library of Congress card number MicA54-487.

**CHILEAN PARLIAMENTARY  
GOVERNMENT, 1891-1924**

(Publication No. 6848)

Jordan Marten Young, Ph.D.  
Princeton University, 1953

Chilean parliamentary government from 1891 to 1924 was a successful attempt by the wealthy classes in Chile to control the political machinery of the country through the legislative branch of the government. Various political parties, all representing a very small percent of the population, gave Chile thirty-four years of stable government. Although the cabinets were constantly changing, the political life of the country was not seriously disrupted. Rapidly rotating cabinets permitted all the political parties to take part in formulating administrative policy. None were excluded from participation in the cabinet.

Since the 1891 revolution had removed the threat of a strong chief executive, the political parties of the oligarchy fought among themselves for control of the governmental apparatus from 1891 to 1925. This struggle produced greater political sophistication for many sectors of Chilean society. Throughout the period politicians were forced to turn more and more to the middle class and to the working classes for voting power. Slowly Chile progresses toward more representative government.

As the cultural level of the population was raised, and the country became economically diversified, a middle class began to develop and assume a role of importance. With the appearance of labor unions, the working class, too, developed some independence and gradually gained a voice in the government. Constant criticism of the Chilean political and social structures by factions within the oligarchy, the rising middle class, the labor unions, and finally the Army made the population keenly aware of the defects in the parliamentary machinery.

Before 1915 the oligarchy was able to govern the country without serious disturbances. Congressional and Presidential victories were obtained by vote buying and the altering of the electoral registers. Since the parties appearing on the ballot represented only the aristocracy, social and economic issues were carefully ignored and the political life of Chile remained unchanged. The appearance, in 1915, of Arturo Alessandri led to revolution and the downfall of parliamentary government. For the first time in Chilean history the chief executive appealed to the mass of the population and made social issues campaign issues. After his successful bid for Senator in 1915, Arturo Alessandri utilized the growing dissatisfaction of the population and won the presidency in 1920. A conservative Congress, however, made the institution of the President's reform program impossible.

Although Arturo Alessandri was extremely popular

among the middle class and the urban workers, the conservatives in the legislative branch feared and thwarted the strong executive. Because Arturo Alessandri thought he represented public more than the Congress did, he intervened in the March 1924 congressional elections to obtain a majority in both houses of Congress. When Alessandri could not control Congress, the army acted.

In September 1924, young army officers led a rebellion and took over the reins of government. Answering the demands of the middle class and the laboring population, and at first encouraged by President Alessandri, the army forced through Congress the approval of many social and economic reforms. Thus, Alessandri's four years as chief executive of the country ended in the breakdown of slow democratic evolution and placed the army temporarily in control of the political life of Chile. The twenty-nine year rule by oligarchy had been more stable, though it was less productive. President Alessandri resigned shortly after the military coup occurred as he could not control the young militarists. The conservatives took advantage of the chaotic situation to regain control of the administrative apparatus of the country. The young army officers, dissatisfied with the actions of the oligarchy, organized another revolution in January 1925 and recalled President Alessandri.

Upon his return, the President organized a committee to write a new constitution and the document was placed before the people for a vote in August 1925. When the public overwhelmingly approved the new constitution, Chile returned to a presidential form of government.

Chile in 1925 was a dramatically different country than it had been in 1891. The oligarchy provided stable government from 1891 to 1920, yet in their attempts to appease the dissatisfied mass of the population they allowed the country slowly to move toward more representative government. Arturo Alessandri's appeals to labor and the middle classes resulted in chaos and political disorganization from 1920 to 1925 but produced social legislation which had long been drastically needed.

Microfilm copy of complete manuscript of 261 pages, \$3.26. Enlargements 6" x 8", 10¢ per page. Library of Congress card number MicA54-488.



## LANGUAGE AND LITERATURE

### LANGUAGE AND LITERATURE, GENERAL

#### ANIMA AND AFFECTUS: THEORIES OF THE EMOTIONS IN SIXTEENTH CENTURY GRAMMAR SCHOOLS AND THEIR REFLECTIONS IN THE WORKS OF SHAKSPERE

(Publication No. 6983)

Rolf Hans Soellner, Ph.D.  
University of Illinois, 1953

The study which is here abstracted represents a contribution to a historical appreciation of the role of the emotions in Shakspeare's works. The first chapter outlines the conclusions drawn by previous investigators. It was hardly possible nor could it have been very profitable to examine all major works of literary criticism in which the passions in Shakspeare's dramatic and poetic writings are discussed at length. But one piece of early criticism, John Dryden's essay on "the Grounds of Criticism in Tragedy," which he used as the Preface to 'Troilus and Cressida' (1679) is discussed as a test-case because it has been claimed as an antecedent of the modern historical approach to Shakspeare's psychology. On closer examination, Dryden equates "to describe the passions naturally" and "to write pathetically." Dryden's critical concept of "passion" — always a singularly vague term — is primarily rhetorical and not psychological. Scholarly investigations, on the other hand, beginning with an essay by Richard Loening in the Shakespeare Jahrbuch (1895) connected the behavior of Shakspeare's dramatic characters under emotional stress with a "Renaissance psychology" not always critically examined. The introductory chapter of this study will show that the transmission of psychological ideas in the Renaissance, and also these ideas themselves, deserve further examination. Though it has been noted that the usage of psychological concepts by Shakspeare's immediate predecessors is correlative to their school training, the nature of psychological information transmitted by Elizabethan schools has not been determined — a gap which the present study endeavors to close.

As the Elizabethans associated emotional activity with a definite concept of the soul, the title of 'Anima' and 'Affectus' has been chosen. The emphasis of the study is on the basic information which Shakspeare was supposed to receive about these concepts in grammar school rather than on what he can be proved to have remembered as a playwright. The main contention is that an ordinary grammar school education could have furnished Shakspeare with the basic knowledge of the soul and the emotions which he shows in his works.

In the second chapter, these concepts are set into their ideological background which is considered under the philosophical, religious, and pedagogical aspect. From the vantage point achieved the influence of the climate of Renaissance instruction on the denotations and connotations of emotional terminology is appraised.

In the description of the grammar school curriculum T. W. Baldwin's Small Latine & Lesse Greeke is the guide for arrangement and general contents. In chapters III-IX of the dissertation, this curriculum is followed from the elementary construing of Latin in lower grammar school to the more intensive study of moral philosophy in upper grammar school. For practical purposes, the main features of faculty psychology as transmitted in these schools are centered around certain authors or subjects though actually this information was given unsystematically in shreds and pieces.

Chapter III deals with the moral material, psychological in embryo, contained in such elementary schoolbooks as grammar and dictionary; chapter IV with the fundamental ideas of the Christian poets read in grammar schools. Chapter V establishes the place of the emotions in dramatic theory as developed from Terence's comedies. Chapters VI and VII discuss the instruction given in rhetoric on the handling of emotional passages. Chapter VIII considers the emotional concepts in the teaching of poetry. Chapter IX shows how grammar school aimed at giving the schoolboy the best from moral philosophy. In this sense, Erasmus had said of the learned grammarian: "Wherever he may turn, he will easily show how important it is to have been started by the best."

Microfilm copy of complete manuscript of 275 pages, \$3.44. Enlargements 6" x 8", 10¢ per page. Library of Congress card number MicA54-489.

#### AN INTRODUCTION AND ANNOTATIONS FOR A CRITICAL EDITION OF 'AMELIA'

(Publication No. 6845)

Augustus Robert Towers, Jr., Ph.D.  
Princeton University, 1952

This dissertation attempts to provide the scholarly material for a critical edition of Amelia. Its orientation is, for the most part, historical and descriptive; its purpose is to provide the bases for comprehension and evaluation — not the evaluation itself.

Part one consists of an Introduction, which is divided into four chapters. Chapter one deals with the composition and publication of Amelia. It explores the relevant aspects of Fielding's biography and places the novel in the context of his activities and publications as Justice of the Peace for Middlesex.

The circumstances of the actual publication are also examined.

Chapter two concerns the contemporary reception of *Amelia*. Three major types of critical commentary during the 1750's may be distinguished: the relatively impartial reviews, the comments — chiefly hostile and often scurrilous — which stem from the journalistic "war" in which Fielding was involved during 1752, and, finally, the criticisms made by Fielding's chief literary rival, Samuel Richardson, and his circles of bluestockings. The chapter concludes with a brief account of *Amelia*'s reception until the end of the eighteenth century.

Chapter three investigates the intellectual, social, and literary background of *Amelia*. Fielding's emphatic statement of the didactic purpose of the novel is taken as a basis for examining first his religious and moral positions. Here the background of latitudinarian Anglicanism and the growth of sentimental morality during the first half of the eighteenth century become relevant as they are reflected in *Amelia*, particularly in the errors and conversion of Mr. Booth. Related to its religious and moral didacticism is the social purpose of *Amelia*; as an early novel of social protest it exposes "some of the most glaring evils, as well public as private," which infested the country at that time. The nature of these evils — ranging from prison conditions to duelling and gambling — is discussed and associated with contemporary accounts of the problems. One aspect of Fielding's broad social purpose is singled out for special study, for it lies at the heart of the novel — this concerns *Amelia* as the story of a marriage. Fielding's views on this subject are part of a long moralistic tradition dealing with the marital relationship.

In connection with the literary background of *Amelia*, Fielding's characterization is examined in terms of his stated theory and practice in his earlier novels. *Amelia* contains several distinct classes of characterization, each of which serves both a fictional and a didactic function within the novel. A concluding section of Chapter three deals with the form of *Amelia* as it derived from the neoclassical theory of the epic. *Amelia* is contrasted with the earlier novels in matters of plot, tone, the use of irony, and increased sentimentality.

Chapter four studies the text of *Amelia*. It contains a bibliographical description of the first edition and an account of the variations between the first and second editions. A list of these variations is appended to the chapter.

Part two of the dissertation consists of annotations to the novel. These are of considerable variety, but their general purpose is to provide the information necessary for a full understanding of the events, allusions, and statements within *Amelia*; they are also designed to supplement the historical and literary materials dealt with in Chapter three of the Introduction.

Microfilm copy of complete manuscript of 287 pages, \$3.59. Enlargements 6" x 8", 10¢ per page. Library of Congress card number MicA54-490.

## LANGUAGE AND LITERATURE, CLASSICAL

### THE HERACLIDAE OF EURIPIDES: AN INTRODUCTION AND COMMENTARY

(Publication No. 7076)

Elizabeth Patricia Neils Boulter, Ph.D.  
Bryn Mawr College, 1953

The purpose of this dissertation is to provide a comprehensive annotated edition of the *Heraclidae*. Both the Oxford Text of Gilbert Murray (1902), which has been used as the basis for this study, and the most recent English annotated edition of the play (Pearson, 1907) favor the theory that the text of the *Heraclidae* preserved in the medieval manuscripts is severely mutilated. Wilamowitz-Möllerndorff, the chief proponent of this argument, believed that a whole episode of the original had been omitted and that large sections had been rewritten for a revival performance of the play in the fourth century B. C. For more than fifty years, criticism of the *Heraclidae* has centered on this problem. It can now definitely be shown that the text has suffered only minor disruptions of the type that normally occur in transmission.

Euripides drew upon Theban and local Attica tradition for his version of the legend of the *Heraclidae*. Unfortunately, the few fragments of the *Heraclidae* of Aeschylus which have survived are of little value, but one of them indicates that Euripides followed his predecessor in including in the play the rejuvenation of Iolaus. Other elements, such as the setting of the action at Marathon and the burial of Eurystheus at Pallene, seem to be derived from local saga. The sacrifice of the daughter of Heracles, who is unnamed in the play, has previously been considered the invention of Euripides. There is evidence, however, which indicates that this element too was derived from local cult legend. Euripides did, however, make one change in tradition. The substitution of Eurystheus' capture for his death in battle enabled him to introduce the oracle of Loxias which serves to link the legend of the past with contemporary events.

The date of the *Heraclidae* has not been preserved, and a considerable number of dates ranging from 445-44 to 418-17 B. C. have been advocated by previous scholars. Metrical criteria and allusions to contemporary events within the play itself coincide in suggesting the spring of 429 B. C. as the most likely date for the first performance of the *Heraclidae*. The oracle repeated by Eurystheus in lines 1030ff. is undoubtedly a prophecy *ex eventu* of the invasion of Attica in the summer of 431 B. C. and of the sparing of the Tetrapolis in the following summer. The question of whether Eurystheus should be put to death when his life had been spared on the battlefield may be regarded as an allusion to the murder of the Peloponnesian ambassadors to Persia who had been turned over to the Athenians by Sadocus of Thrace in the summer of 430 B. C. (Thuc. 2.67.4).

An analysis of the plot, imagery, and characterization indicates that the play was rather hastily written. The individual episodes of the play are only loosely connected. The center of interest is in the



allusions to contemporary problems and situations, and this fact undoubtedly accounts for the evidence of hurried composition.

In the commentary, the principle of retaining the reading of the manuscripts wherever possible has been followed, unless some minor change produces a superior reading. One such emendation has been suggested by the author. In addition to textual criticism specific problems of dramatic technique, language, and interpretation are considered.

Microfilm copy of complete manuscript of 172 pages, \$2.15. Enlargements 6" x 8", 10¢ per page. Library of Congress card number MicA54-491.

#### THE INFLUENCE OF THE CLASSICS ON THE POET WIELAND

(Publication No. 7055)

Theodore Henry Mueller, Ph.D.  
Northwestern University, 1953

The aim of the dissertation is not to present the development of Wieland's attitude towards the classics, but rather to collect and present the numerous references to the period and to the authors of ancient Greece and Rome and to show from them his relationship to antiquity. The dissertation is limited to the references found in his poems only. The material is divided into two sections; the first deals with the general aspects of antiquity: its history, geography, art, society and myths. In the second part the influence of the classical authors is presented in a generally chronological order.

Wieland expresses the greatest admiration and veneration for the Greek and Roman world. It represents the pinnacle of what mankind has achieved in art, literature, wisdom and philosophy of life. He refers to Greek history, especially to the fourth and third century B.C., while the period of the dying republic and the centuries of the emperors mark his predilection in Roman history. He mentions the foremost localities of Greece and Sicily, noted for their beauty or popular for their religious rites or mythological events. He is intimately acquainted with the Greek sculptors and painters and frequently mentions their works. He refers to customs and traditions of antiquity, and often ascribes similar ones to nations mentioned in his poems. He alludes to general practices in civil life among the Greeks and the Romans; he imitates their oaths, or mentions their public places and buildings. Greek mythology is an inexhaustible source from which he draws constantly.

The major classical authors of Greek and Roman literature influenced Wieland just as much as did the writers of the Hellenistic period. The many references to the *Iliad* and the *Odyssey* or to the epic world and epic technique reveal an unquestionable influence. Sappho rates high in his esteem, but Anacreon and the Roman poets Tibullus, Catullus and Ovid, although he is much indebted to them, have

lost favor because of their sensuous verses. Among the philosophers, Socrates received highest veneration; he is the ideal human being whose wisdom remains unquestioned. Plato is the eminent philosopher whose theories are most frequently adduced. Of the Post-Platonic philosophers Wieland favors the Stoics and the Epicureans. He states his predilection for Xenophon as a historian, general and philosopher. Cicero and Horace are his favorite companions, whose maxims and outlook on life have become his philosophy and whose works are his joy and a comfort to his old age. While Juvenal, Pliny and Seneca play only a secondary role, his poems reveal an intimate acquaintance with Lucian and Plutarch.

Wieland's taste and interest lie not in the supernatural beings of Aeschylus and Sophocles but rather in the more human traits of Homer's, Euripides' and Vergil's actors, in Xenophon's living pictures of Socrates and Cyrus, and especially in life as seen by Horace. He reveals a disposition which perceives the ludicrous and comical of a situation, such as occurs in Homer's and Horace's verses. His interest in the human rather than in the more heroic and exalted beings of the early Greek dramatists aroused Wieland's sympathies in the Hellenistic writers, especially the satire of Lucian and the charm of Plutarch.

Microfilm copy of complete manuscript of 331 pages, \$4.14. Enlargements 6" x 8", 10¢ per page. Library of Congress card number MicA54-492.

#### LANGUAGE AND LITERATURE, MODERN

##### A STUDY OF THE USE OF EMOTIONAL AND INTELLECTUAL IMAGERY IN THE NOVELS OF GEORGE MEREDITH

(Publication No. 7075)

Deborah Sands Austin, Ph.D.  
Bryn Mawr College, 1953

George Meredith was unique in his period in his perception of the possibilities for new and startling uses of metaphor in fiction. He experimented vigorously with imagery in his novels, and in almost every novel he commented incisively on the value of metaphor.

The present study is a consideration of two major types of imagery used by Meredith in his fiction. Emphasis is laid primarily on the uses to which the imagery is put by the novelist—on the relation of the imagery to the work as a whole—rather than on any attempt to isolate the images as figures of speech or clues to former experience of the writer. It has been possible by this means to discern much that is significant concerning Meredith's growth as a novelist, for we are able to see that his changing concept

of the meaning of experience in the novel led him to employ in fiction certain techniques that had hitherto belonged chiefly to poetry.

Of the two types of imagery studied, Emotional Imagery is most prevalent in the early books, rarely appearing in those published after *Beauchamp's Career*. Simple in expression, making its primary demands for comprehension on the intuition and emotion of the reader rather than on his intellect, Emotional Imagery does not serve as commentary on the experience it illuminates. Rather, with its simplicity of wording and dependence on the perception of symbols, it tends to reproduce the experience itself in its most immediate form, and to allow the reader to see the metaphorical value such experience can hold for the character who has it.

The distinguishing qualities of Intellectual Imagery are its verbal complexity and its demands on the intelligence of the reader. All imagery is sensuous, but Intellectual Imagery speaks to the senses while making at the same time rigorous demands on the brain. Intellectual Imagery forms a commentary on whatever it is used to illuminate, its tone and nature implying intellectual assessment of action, character, or situation. More prevalent in the novels than Emotional Imagery, its uses vary from scenic description through physical delineation of character to its most artistically satisfying use—the evocation of mental and emotional states.

While the two types of imagery are present to some degree in all the novels, the proportions vary from book to book in a significant manner. They show us that as Meredith matured as a novelist his interest in experience for its own sake waned. He turned instead to analysis of the effect of experience upon character, and his concept of the true province of the novelist—the minds of his characters—approached that of the great novelists of the twentieth century.

Meredith's love of ideas led him at first to use Intellectual Imagery to illuminate abstract thought, generally contained in digressions from the main thread of the story. Later, he was able to substitute passages dealing with the thought-process of his characters for sections of abstract digression. Imagery once used for the purpose of venting the author's spleen over some question of the day now pictured the mental and spiritual adventures of men and women, and added immeasurably to their stature as characters.

A passionately conscious craftsman, Meredith did not hesitate to bring to a hostile audience of fiction-readers that type of oblique statement which had long given power to poetry. Through a study of his uses of imagery, we are enabled to see that Meredith's methods and aims as a novelist were always moving closer to those to be used later and with more success by the great novelists of our time.

Microfilm copy of complete manuscript of 383 pages, \$4.75. Enlargements 6" x 8", 10¢ per page. Library of Congress card number MicA54-493.

## THE ETHICAL ELEMENT IN LITERARY CRITICISM OF THE ENGLISH RENAISSANCE

(Publication No. 6891)

Helen Margaret Condon, Ph.D.  
Stanford University, 1953

The critical writings of the English Renaissance have a comprehensive moral tenor that goes far beyond mere insistence on the didactic function of poetry. To disparage this insistence without relating it to a larger philosophic outlook is to misrepresent or misunderstand the literature as well as the criticism of the Renaissance. The present investigation has been undertaken in the attempt to establish this ethical element, to clarify its implications, and to determine the manner in which moral concepts pervaded and influenced literary theory and literary judgments. This study comprises writings of authors who contributed to Renaissance criticism in England in the sixteenth and seventeenth centuries, including Milton and excluding the criticism which appears in the plays of the period. Some non-critical works are mentioned with a view to clarifying the concepts in question.

The ethical element finds expression in a consistent view of the nature and end of man which derives from belief in an objective and absolute system of morality, one that is basically Christian. Man, composed of a material body and a spiritual soul with powers of intellect and free will, is destined for a supernatural eternal life with God, if certain conditions are fulfilled. The main tenets of this system can be ascertained from a close examination of the writings of the English critics, who related learning and literature, as well as other aspects of living, to man's nature as a rational being with moral responsibilities and to his eternal destiny as a creature of God.

The critical theory builds upon this ethical foundation. To it are integrally related the concepts of imitation and allegory, of the rational basis of poetry to which the Renaissance ascribed, and especially of the moral function of art. This function is variously interpreted by the critics as a stimulus to virtue, a rebuke of vice, a source of solace, and a method of civilizing. It must be remembered, however, that moral profit means far more than a narrow and stultifying didacticism. Because the virtuous life is for the Renaissance writers a high and practicable ideal, the means conducive to it are looked upon as a strong and activating force. Poetry achieves its end by its appeal to the imagination, by teaching indirectly, and by delighting the reader with its subject matter, melody, and manner of treatment.

The idea of the moral function of poetry which informs most of the literary theory carries over into discussions of the genres. Heroic poetry, tragedy, and comedy are considered in terms not only of ethical purpose, which is specifically defined for each type, but also in terms of society. The notion of poetic form as it is presented by Samuel Daniel has a direct bearing on the question of morality.

The moral issue is, of course, predominant in



the late sixteenth-century attack on poetry. The defenders, besides successfully answering the charges of their opponents, study the nature of poetry itself and evaluate it in the highest terms they know. Renaissance criticism is concerned with other aspects of poetry than the moral one, for some writers are solely or chiefly occupied with technical matters. In the total output of the period there is not a large amount of judicial criticism — that is, evaluative comments on contemporary English authors. The ethical element figures but slightly in these judgments because of their casual nature and secondary importance.

Microfilm copy of complete manuscript of 185 pages, \$2.31. Enlargements 6" x 8", 10¢ per page. Library of Congress card number MicA54-494.

A TEXTUAL AND CRITICAL EDITION  
OF HAWTHORNE'S BLITHEDALE ROMANCE

(Publication No. 6929)

Maurice Aaron Crane, Ph. D.  
University of Illinois, 1953

Nathaniel Hawthorne completed The Blithedale Romance in May, 1852. By the following July the novel was a success in both England and America. In rushing the book through the presses, neither the author nor his publishers took care to see that the manuscript was faithfully reproduced. No subsequent edition has returned to the manuscript as a source. This dissertation faithfully reproduces the manuscript version of the novel, showing all of Hawthorne's deletions and emendations, and indicates all variants in the first edition, which has always served as a model upon which later editions were based.

The dissertation traces, as well, the parallels between Brook Farm and Blithedale, the use of notebook materials in the novel, the number and nature of changes made by Hawthorne and also those made by Hobart and Robbins's five compositors, who, in setting type for Ticknor, Reed, and Fields, acted as unofficial arbiters of the spelling, punctuation, and diction which appeared in the printed form of The Blithedale Romance.

A close examination of the novel reveals that, contemporary criticism notwithstanding, Hawthorne's moral scheme in this book is the same as that of his other works, and that this novel is no more "realistic" than any of the others. The narrative technique, however, is unique in the Hawthorne canon, and is an early experiment in what later developed into the "point-of-view" technique.

Microfilm copy of complete manuscript of 491 pages, \$6.14. Enlargements 6" x 8", 10¢ per page. Library of Congress card number MicA54-495.

THE PICARESQUE TRADITION IN ENGLISH  
FICTION TO 1770: A STUDY OF POPULAR  
BACKGROUNDS, WITH PARTICULAR  
ATTENTION TO FIELDING AND SMOLLETT

(Publication No. 6931)

Harold Kelly Crockett, Ph.D.  
University of Illinois, 1953

This dissertation emphasizes English popular literature of the sixteenth, seventeenth, and eighteenth centuries as the major source of the picaresque for eighteenth century English novelists, and Fielding and Smollett as its chief cultivators. It is divided into ten chapters. The first two define and show the relationship of the picaresque and realism, and trace their English development to the eighteenth century. Chapters III and IV illustrate the picaresque elements in native jest-books, criminal biographies, and other popular writings. Chapter III deals with general picaresque matter, while Chapter IV analyzes those features which receive little or no attention abroad. Chapters V and VI treat Defoe, Richardson, Sterne, and minor picaresque novelists, and Chapters VII to X are devoted to Fielding and Smollett.

Chapter VII denies a strong foreign picaresque influence on Fielding's and Smollett's novels, and stresses the debt they owe to native literature and traditions. Chapter VIII discusses their central characters and attendants as picaros. Chapter IX takes up other picaresque elements in their novels, and shows that they follow native patterns. The first part of Chapter X points out that the latter half of the eighteenth century recognized the relationship of their novels to the picaresque in its comparison of them with foreign picaresque works, and in its reaction against realism in fiction which led it to condemn picaresque elements in the works of Fielding and Smollett. The second part sums up the conclusions of this study.

These are: The picaresque tradition in England was derived from native sources and developed along native lines. Foreign influence was a minor element. By the early seventeenth century, England had produced more rogue literature than any Continental country, but the preëminence of the drama prevented English writers from developing the novel at that time. Interest in the rogue, however, was kept alive by the vogue of the criminal biographies, by jest-books, books of characters, and other popular literature. Translated foreign picaresque novels introduced no new matter to English readers.

Significant differences exist between English and foreign picaresque fiction. The English anti-hero's character is frequently a mixture of heroic and roguish traits. He does not become a rascal through necessity and is rarely a petty thief. He is often a gentleman with picaresque activities consistent to his class. He is seldom in service, and servants are more frequently castigated than their masters. Love and marriage cheats play a more prominent role in England. Satire on the gentry, on politicians, and upon the social relations of men and women receives

more attention in English picaresque works. The picaresque in England was not a reaction against chivalric or heroic romances, or a protest against social evils; laid greater stress on morality, and demanded punishments and rewards for good and evil actions.

These differences have been the basis for denying the works of English realistic novelists like Defoe, Fielding, and Smollett a picaresque status, but it must be realized that the novels of these writers are outgrowths of a tradition corresponding to that which produced the picaresque novels in Spain and France. The differences are merely indications of the independent development of the English picaresque tradition.

Microfilm copy of complete manuscript of 676 pages, \$8.45. Enlargements 6" x 8", 10¢ per page. Library of Congress card number MicA54-496.

#### A STUDY OF AMERICAN ANTI-SLAVERY JOURNALS

(Publication No. 6850)

Joseph Anthony Del Porto, Ph.D.  
Michigan State College, 1953

America, in the early decades of the nineteenth century, was stirred by a general reform movement consisting of numerous individual crusades against social evils, a movement carried on through propaganda in the form of pamphlets, books, periodicals, and the weekly journals disseminated usually by reform societies, whose officials in addition hired agents and lecturers to aid in the work of public information. The movement, a mixture of humanitarianism and liberalism related to and growing out of eighteenth-century patterns of thought, involved practical application of the principles of individual rights and social responsibility to the evils of slavery, intemperance, war, and others.

Of the crusades, the struggle to abolish slavery in time took precedence, and was responsible for a major test of the rights of individuals to such traditional civil liberties as freedom of speech and freedom of the press. As the result of attacks by abolitionist papers on slavery and those who supported slavery, a crisis concerning freedom of the press arose in the North and was resolved in favor of the abolitionists when they convinced the American public that any threat to freedom of expression was a threat to other civil liberties, and in effect a dangerous undermining of democratic ideals.

The rise of the abolitionist papers, their editorial objectives and practices, their editors, and their relationship to the total anti-slavery movement, together with the causes and effects of the struggle for freedom of the press, are embraced in this study.

The central point of reference in the study is the work of William Lloyd Garrison, whose Boston *Liberator*, published from 1831 to 1865, has come to be regarded as the fountain-head of anti-slavery agitation. Although preceded by a few pioneers in the field of

anti-slavery journalism, notably Benjamin Lundy, it was Garrison who stirred Southerners into denunciation of Northern agitators, and Garrisonian tactics which stirred Northerners attempts to stifle the publications attacking slavery.

By 1840, anti-slavery organizations had split over the issue of political action against moral suasion as a proper means of abolishing slavery. The anti-slavery press, as a result, was similarly divided, one side voicing Garrisonian moral suasion arguments (made complex by non-resistance, disunion, and women's rights), the other supporting political action. Those in the latter group aided in forming the Liberty party, and in turn supported the Free Soil party and the Republican party. Both sides played a part in turning the tide of public opinion against slavery.

The victory of that press over those who would suppress it, although incidental to the slavery controversy, was a victory for the civil rights tradition in America, and had far-reaching results in determining the course American journalism has followed down to the present day.

Microfilm copy of complete manuscript of 308 pages, \$3.85. Enlargements 6" x 8", 10¢ per page. Library of Congress card number MicA54-497.

#### ENGLISH DRAMATIC CRITICS OF THE NINETIES AND THE ACTING OF THE "NEW THEATRE"

(Publication No. 7152)

Flora Elizabeth Emerson, Ph.D.  
Bryn Mawr College, 1953

To the late nineteenth-century revolution in the English theatre and especially acting, four major dramatic critics contributed significantly.

They began work as the theatre was still emerging from a long eclipse: the years 1800 to 1860 had been barren, except for great acting, and by 1850 even that had largely disappeared. By 1860 the theatre was ranked as so "contemptible" that educated Londoners avoided it. Only on the edge of stagnation was there a resurgence: in 1861 Fechter, a Frenchman, triumphed with an informal, natural Hamlet; some original English drama at long last appeared, the "Cup and Saucer" plays of Robertson, trimly and realistically staged and acted by the Bancrofts in the mid-sixties; in 1871 Irving reached front rank professionally with a personal style inspired by naturalism rather than "tradition". Finally, a new type of dramatic criticism emerged.

By 1870 the immense growth of newspaper circulation provided a vast audience receptive to the new theatrical reviewing — "colorful," emphatic, and personal. One "new" journalist, Clement Scott, acquiring a huge following, materially encouraged playgoing, advanced Irving's popularity, promoted naturalistic staging, and stimulated able acting by increasing appreciation of it. No intellectual, Scott



did almost nothing to advance the drama, and his unflinching recognition of great acting was instinctive rather than based on reasoned standards. Gradually he changed from a pioneer to a reactionary opposing the new wave of theatrical reform.

Now the cry was for native drama and for standards. A stage flourishing by 1878 still presented, besides Shakespeare, mainly farces and adapted French "well-made" intrigues; standards even for acting were personal and arbitrary. Henry James, newly arrived from Paris, finding the English theatre inferior, analyzed it by rigorous continental standards and prescribed training schools for actors, objective criteria for performances, simpler staging, accurate presentation of classics, and a creditable English drama. Another cosmopolitan young critic, William Archer, began his one-man crusade for better plays.

The reform prospered, and in 1889 Pinero produced his first "problem play" and, more important, the first Ibsen translation was staged. As Archer, the translator, predicted, Ibsen's drama thereafter inspired native writers, initiated a new acting style, and made drama a major topic in startled London. Archer's recruit, Bernard Shaw, already a tentative playwright, in livelier and more biased criticism represented the theatre, intellectually self-respecting and morally vigorous, as a potential church for discussing vital topics and showed that acting itself declined when players had no important drama to transmit. Resulting from this crusade were the best work of Pinero and Jones, Shaw's own plays, Galsworthy's, Granville-Barker's, and Barrie's.

Archer, cosmopolitan scholar, humanistic critic-teacher, visualizing a great national theatre after European models, expounded it with skilled pedagogic technique. Shaw, the artist-critic, stressed rather his ideal drama, intellectual, musically rhetorical, written for accomplished execution. Yet they usually reinforced each other on vexed topics in the intense struggles of the period over theories, often moderating extremes. Generally, they fostered naturalism against anti-naturalism by demanding a strong drama, which, in a scientific age, emerged largely naturalistic and required realistic acting. Yet they considered important Poel's Elizabethan presentation of Shakespeare; favored musical, heightened reading of verse; rejected mere self-expressionism. Opposing undisciplined individualism, they re-defined the actor's function — to interpret the dramatist faithfully, not ignoring or supplanting him; they helped end actor-manager monopolies, favored ensemble acting against over-emphasis on stars. They urged public honors for actors, but considered social ambitions detrimental. They promoted academies for acting, a repertory system and national theatre.

Parallel movements have affected dancing, preaching, and orchestral conducting. But the unusual vitality of today's English theatre proves how effective great criticism can be.

Microfilm copy of complete manuscript of 297 pages, \$3.71. Enlargements 6" x 8", 10¢ per page. Library of Congress card number MicA54-498.

## MILTON'S RESIDENCES AND REAL ESTATE HOLDINGS

(Publication No. 6947)

Paul Egidius Grabill, Ph.D.  
University of Illinois, 1953

This thesis is a study, in chronological order, of the houses which John Milton owned or occupied in the course of his lifetime. Recent discoveries have made possible significant additions to our knowledge of this phase of the poet's biography. This thesis attempts to assemble and interpret all evidence bearing on this subject. Floor plans, surveys, maps, tax records, contemporary descriptions and allusions, biographical and auto-biographical statements, and parish records are among the variety of sources from which this evidence is drawn.

The first chapter deals with two Bread Street properties, the Spread Eagle and the Rose, owned by the poet's father. We are fortunate in having detailed floor plans and descriptions of these two properties. The chapter also discusses the vexing question of the poet's birth-place. The traditional view, that he was born at the Spread Eagle, has been seriously challenged in recent years. This thesis examines all available evidence on the subject and confirms the traditional point of view.

The second chapter considers the years between Milton's graduation from Cambridge and his departure from Italy. Professor Harris Fletcher has recently shown that this six year period was not spent entirely at Horton, as was formerly assumed. This thesis brings in evidence to confirm Professor Fletcher's contention that the period was divided between Hammersmith and Horton, and suggests that possibly the poet never assumed residence at Horton at all.

Chapters three and four trace the succession of homes from Milton's return from Italy to his death. This includes thirteen different locations: St. Bride's churchyard, Aldersgate Street, Barbican, High Holborn, Charing Cross, Scotland Yard (in Whitehall), Petty France, Bartholomew Close, Holborn, Jewin Street, Bunhill, Chalfont St. Giles, and Little Britain. These chapters take up a variety of related questions such as: Where was the house located? What did it look like? Why did Milton move there? How long did he stay? Who lived with him? Who were his neighbors? This succession of dwellings reflects the many vicissitudes of the poet's life.

The last chapter deals with the real estate investments of Milton and his father. The concern of the elder Milton for this kind of property furnishes a background for the poet's later interest along this line. The success of his investments shows that Milton possessed a good head for business.

It has now been over half a century since Masson published the final volume of his *Life of John Milton*. Many of the biographical materials which Masson lacked have been discovered in the last fifty years. It is the purpose of this thesis to add a few more details to yet another aspect of the poet's life: his residences and real estate holdings. My purpose has

been to bring together in one place the materials relative to this subject.

Microfilm copy of complete manuscript of 182 pages, \$2.28. Enlargements 6" x 8", 10¢ per page. Library of Congress card number MicA54-499.

#### BROWNING AND IMPRESSIONISM

(Publication No. 6896)

Charles Vincent Hartung, Ph.D.  
Stanford University, 1953

Browning's most distinctive poetic achievement is probably his development of the impressionistic style. The influence of this style on modern poets has been extensive; Ezra Pound and William Carlos Williams are particularly indebted to Browning's innovations.

Investigation into Browning's background discloses that his distinctive manner of expression was shaped not only by personal abilities and an unconventional education but by a number of historical influences. Romanticism, the realism of Balzac, native British empiricism, German idealism, the ideology of science, and the effects of the industrial revolution have all left their marks on Browning's impressionism.

Comparison of a typical impressionistic poem by Browning, *The Bishop Orders His Tomb*, with representative poems by Jonson, Shakespeare, Donne, Pope, and Keats demonstrates how Browning has subordinated the traditional features of poetry—elevated diction, rhetorical imagery, heightened versification, orderly structure—to psychological verisimilitude.

The key to Browning's impressionism is his emphasis on dramatic immediacy. Browning dramatizes the consciousness of his spokesmen by using stylistic devices to represent immediate individual reactions to particularized dramatic situations. A poem by Browning may emphasize physical scene, social situation, or personal feeling, but whatever the subject he strives constantly for the effect of dramatic immediacy. In descriptive poems dramatic immediacy derives from representation of personal attitudes in reaction to sense detail. In poems that stress social situation dramatic immediacy grows out of conflicts in action and attitude. In poems that emphasize subjective feeling dramatic immediacy enters through contrasts in moods and ideas. Throughout Browning's poems dramatic purpose determines poetic expression.

Underlying Browning's conception of dramatic situation and his adherence to the impressionistic style is a fundamental belief in the personal nature of truth. This does not mean that Browning does not recognize other forms of truth. He sees value in the truth of fact; he asserts the claims of ideal truth; he has faith that in any situation objective truth exists. He admits also the claims of morality and of the social situation. But he believes that all of these forms of truth depend upon human interpretation and

are subject to error. In *The Ring and the Book*, his most ambitious work, Browning embodies his evaluation of human truth and declares his adherence to artistic truth. For Browning artistic truth is the closest possible correspondence between immediate perception and its symbolic form. He employs the impressionistic style to represent immediate experience and thus to reveal both human and artistic truth.

Microfilm copy of complete manuscript of 230 pages, \$2.88. Enlargements 6" x 8", 10¢ per page. Library of Congress card number MicA54-500.

#### VITAL AND ARTISTIC DIMENSIONS OF THE *CARTAS MARRUECAS* OF JOSÉ CADALSO

(Publication No. 6817)

John B. Hughes, Ph. D.  
Princeton University, 1953

It has been our intention in this dissertation to attempt a "possession" of the total reality of the *Cartas marruecas* in so far as the latter was accessible to us. Our approach, adapting itself to the nature of its subject, was phenomenological. We have attempted to present the work in a series of functions or dimensions through which its unique human and artistic values appeared most readily perceivable. The levels of meaning, or dimensions treated were the following: historical, ideological, personal and artistic. The first two were considered as being only incidentally important as means of gaining a fuller understanding of the work's personal and artistic dimensions.

Viewed in this light the *Cartas* was seen to be dependent upon the range of vital, ideological, and artistic possibilities available to a Spanish writer during the reign of Carlos III. Cadalso, like some of his contemporaries, was attempting to situate in his own terms the literary and ideological models offered by writers of the French Enlightenment. In the *Cartas*, he completely transformed the intent, "genre", and tone of his model, the *Lettres persanes* of Montesquieu. Unoriginal from the standpoint of ideas, the work is an attempt to make use of some of the purely theoretical conclusions of the latter, derived from an objective and systematic analysis of "la nature des choses", as a basis for the national moral reconstruction of Spain. While as a "crítica" vastly inferior to its model, Cadalso's view of Spain depending as much upon his religious and human preconceptions, as upon the analytical process, the author transcends the banality of his judgements as well as his explicitly didactic intent through an artistic preforming of his subject. The work, a unique repository of artistic possibilities, possesses tragic, elegiac, tragicomic, and novelistic overtones, literary dimensions which are not present in the *Lettres persanes*. These last were found to be fully graspable only through the relating of the work to the dominant aspirations of the author's life as



soldier and patriot. Cadalso's artistic inner consciousness is only partially expressed in the Cartas although fully externalized in his actions. The Cartas is of interest to contemporary criticism, not only for its own intrinsic merits, but also as a forerunner of the social commentaries of Larra and of the novels of Pérez Galdós.

Microfilm copy of complete manuscript of 189 pages, \$2.36. Enlargements 6" x 8", 10¢ per page. Library of Congress card number MicA54-501.

#### NATURALISM IN THE MEXICAN NOVEL

(Publication No. 6901)

Francis Xavier Maggipinto, Ph.D.  
Stanford University, 1953

The first signs of naturalism in the Mexican novel occur in the four short narratives of Emilio Rabasa, La bola, La gran ciencia, El cuarto poder, and Moneda falsa. By attacking the local armed revolt, corrupt bureaucracy, and yellow journalism, and by expressing an undisguised pessimism over the possible eradication of these social ills, Rabasa appears to be following in the tracks of naturalistic socialism as preached by Zola.

Manuel Payno's Los Bandidos de Rio Frio reveals a certain adherence to naturalistic theory in the impress of environmental factors on the character development of Evaristo and Relumbron.

With Heriberto Frias the Mexican novel is more forcefully slanted in the direction of naturalism. Frias learns from Zola to observe and to report phenomena dispassionately in Tomochic. In El ultimo duelo he makes extensive use of documentation in bringing out the malevolent effect of environment on Borrostia. However, Frias borrows most heavily from naturalism in El amor de las sirenas, wherein the predominantly amoral nature of the major characters, Santiesteban and Arguelles, and the interplay of environmental forces in shaping their development reflect a clear adherence to naturalistic precept. Finally, in Misericordias de Mexico and in El triunfo de Sancho Panza, the journalist from Mazatlán stresses socio-economic problems and essays to stir the reader by adopting the naturalistic technique of ending his novels on a note of disillusionment.

Federico Gamboa begins to develop into Mexico's most deliberate naturalist in Esbozos contemporaneos del natural by attempting minute documentation, emphasizing the role of the primitive instincts in man's behavior, and building up the power of environment over the individual. In Apariencias he exploits the theme of adultery and in Suprema ley he blends naturalistic theory and practice by concentrating on the susceptibility of the central character, Julio Ortegá, to his heredity and environment. The "suprema ley," which is the law of the physical attraction of the sexes, operates with telling effect on the will power of a nun in Metamorfosis.

In his most renowned novel, Santa, Gamboa

presents the cumulative effect of the corrupting influence of prostitution on the main character, Santa. Through the use of studied documentation intended to aggrandize the environment, Gamboa simultaneously concentrates on the festering sore of prostitution in Mexican society. Consequently, Santa takes on an essentially purposive effect, accentuating thereby its inherent naturalistic tincture.

Following his return to the Catholic faith, Gamboa channels his naturalism into social studies which permit the continued use of his naturalistically trained sense of observation. This trait is used to excellent advantage in Reconquista and in La llaga both of which are pleas for social uplift.

Mariano Azuelo is the best known figure in contemporary Mexican letters to have come under the influence of naturalism. However, this influence is only evident in those novels which preceded Los de abajo. Heredity and environment are easily identified as the key factors leading to the climax in Maria Luisa as well as in Mala yerba. Los fracasados follows naturalistic precedent in the emphasis given to social evils that persist in Mexican life and Sin amor pays some attention to the effects of environment on the central characters. With Andrés Pérez, maderista external currents cease to affect Azuela, and in Los de abajo his objectivity, his direct prose, and his strong situations are only coincidentally naturalistic.

The impact of Los de abajo on modern Mexican letters has all but stifled the influence of naturalism on the novel, although there is sporadic evidence that the horrendous or grisly detail occasionally found in the works of Gregorio López y Fuentes may have naturalistic antecedents.

Microfilm copy of complete manuscript of 274 pages, \$3.43. Enlargements 6" x 8", 10¢ per page. Library of Congress card number MicA54-502.

#### THE ENGLISH MAY LYRIC: ITS BACKGROUND AND DEVELOPMENT TO THE END OF THE SEVENTEENTH CENTURY

(Publication No. 6905)

Edward Reams Mitchell, Ph.D.  
Stanford University, 1953

An attempt has been made in this dissertation to trace the development of a theme, partly of folk and partly of literary origin, as it appears in English lyric poetry mainly to the end of the seventeenth century. This theme—the May theme, concerned with May Day and the month of May—has an extensive historical background, although much of that background in ancient and early medieval times must be conjectured from incomplete and sometimes uncertain evidence.

The first chapter deals with three principle groups of English May Day customs: (a) mayings and house to house visitations (including various

garland customs), (b) May festivities presided over by a May king or queen (including various dances and games and the chimney sweeps' procession), and (c) water and fire charms.

In chapter two the origins of these folk custom is considered. The point of view developed is largely that held by Mannhardt and Frazer, with some reservations.

Chapter three treats the Continental literary background through the fifteenth century. The main emphasis here is on certain genres thought by some scholars to have derived in part from medieval spring festivals. These genres appeared first in Provençal, Old French, Medieval Latin (goliardic), and Middle High German lyric verse of the twelfth and thirteenth centuries.

The opening portion of chapter four concerns the attitude of the medieval church toward May festivities and the twofold policy of assimilation and proscription which the church adopted in dealing with them. The reaction of late sixteenth and early seventeenth-century puritanism, as discussed at the outset of chapter seven, reveals striking similarities, except that the puritans were able to enact an effective nation wide ordinance against May celebrations, which lasted from 1644 to 1660. The remainder of chapter four, together with chapters five through nine, treats in considerable detail the course of the English May lyric, both literary and popular, from the thirteenth century to the end of the seventeenth. A brief summary of the May lyric to the present time concludes chapter nine.

In spite of the apparent antiquity of certain May customs, no English May or spring lyrics have survived prior to the thirteenth century. The choice of May for most of the spring settings in English lyric and narrative verse became fixed from Chaucer on, largely owing to the influence of the *Roman de la Rose*. During the interval between the publication of Spenser's *Shepherd's Calendar* in 1579 and Herrick's *Hesperides* in 1648, a number of May lyrics were written, some of them of excellent quality, the finest being Herrick's "Corinna's going a Maying." Many of these lyrics show a blend of the native tradition and Italian pastoralism, although others show little foreign influence. A sharp decline, both in quantity and quality, set in early in the seventeenth century following the literary reaction of Jonson and Donne and their adherents, the growing cleavage between broadside and artistic songs, the impact of puritanism on popular observances that gave May verse its vitality, and other influences. The artistic pieces of the first half of this century are largely in the Spenserian tradition. With few exceptions—notably poems by Herrick and Gay, who were in touch with popular traditions—the only May verse with any freshness and vigor to appear for over a century and a half after 1630 was in the popular broadside and folk songs. Meanwhile, May customs themselves, some of which had been revived after the restoration of Charles II, became gradually extinguished by various social and economic forces, so that those remaining are nearly all twentieth-century revivals rather than survivals.

Microfilm copy of complete manuscript of 538 pages, \$6.73. Enlargements 6" x 8", 10¢ per page. Library of Congress card number MicA54-503.

JOSE FRANCISCO DE ISLA, JESUIT  
SATIRIST OF PULPITEERS  
IN EIGHTEENTH-CENTURY SPAIN

(Publication No. 6835)

Russell Perry Sebold, III, Ph.D.  
Princeton University, 1953

Isla's biographers characterize him as naïve, retiring priest, seemingly incapable of a satire on pulpитеers so provocative that it helped motivate the Jesuits expulsion from Spain. *Fray Gerundio*, like Isla's personality and rôle in Spanish history, requires re-interpretation. Considering it illustrative of the novel's decadence when used to critical ends in eighteenth-century Spain, critics nevertheless fail to clarify how *Gerundio*'s criticism actually affects its "novelistic" aspect.

Spain's imperial expansion at an end, its people felt that their country's continued greatness demanded uncompromising maintenance of the conditions that allowed its conquests. Innovations from abroad were feared. The Jesuits endangered the preservation of this *status quo* because, the focal point of their power being Rome, they remained in refreshing contact with Europe and illustrated their trenchant critiques of Spain with foreign examples. Isla's criticism of pulpитеers, partially based on the abstractions of the thought of the Enlightenment, was timeless as well as cosmopolitan, and thus even more threatening to Spain's particularism than seventeenth-century Jesuit criticism. Considering the *Gerundio* a heretical attack on the church,, Spain's clergy and masses applauded when the Bourbon government exiled the Jesuits to free itself of the influence of the Pope's "light cavalry."

Ambitious and self-seeking, Isla entered the Society of Jesus to share in its intellectual prestige. He intrigued in court circles to realize his personal plans. And he criticized others to silhouette his own brilliance as much as to promote reforms, thereby choosing the negative *ad hominem* approach of satire rather than Feijóo's positive impersonal approach. Isla's approach and Hispanic religious orthodoxy permitted him to use modern European thought only negatively. His criticism's positive aspects consisted in only a few momentary insights into Spain's problems.

The *Gerundio* achieves unity by completely adapting to its critical intention its borrowings from Cervantian and picaresque novels. To point his satire on eighteenth-century preachers, Isla, unlike Cervantes, couldn't poetize anachronistic introductions of historic reality into his long-dead protagonist's chronicle and thus adapted the *Quijote*'s pseudo-historic form as that of an apocryphal history to allow those inconsistencies. The Don Quijote of preachers, necessarily a static model of criticizable errors, must be, unlike his ancestor, a



generic character without a will strong enough to develop novelistically. The non-novelistic, Sancho-inspired peasants, unlike their forebear, are presented solely in the dimension of their common sense for an ironical contrast with the senseless friar's pretended intellectual refinements.

Since the picaresque novel's first person would tend to justify the pulpiter and identify Isla with his errors, Fray Gerundio's story is biographical rather than autobiographical. Needing positive values to oppose to the negative ones criticized, Isla found the pícaro's totally negativistic view of the world unsuitable. The picaresque novelists used description to re-create artistically worldly realities experienced as substanceless by many Post-Tridentine Spaniards, but Isla used description to destroy the censurable. The picaresque novel's active description thus become static in the Gerundio's adaptation of them. These and similarly adapted Cervantian descriptions also function to determine the Gerundio's characters as consequences of their environment. Like the nineteenth-century naturalists, Isla took on-the-spot notes of social types and customs for his deterministic descriptions.

Isla, outspoken critic of Spain and court intriguer, gave weight to both motivations for the Jesuits' expulsion. The Gerundio, largely inspired by the Quijote interpreted as a satire, is precisely that Quijote encountered in obsolescent literary manuals. Torres Villarroel's Vida further evidences that the picaresque novel's totally negativistic view of worldly realities was unsuited to Spain's eighteenth-century critics and reformers. The Gerundio's local-color descriptions are also anticipatory to nineteenth-century costumbrismo. At a turning point in Spanish literature, the Gerundio contains germs of literary genres both past and future.

Microfilm copy of complete manuscript of 240 pages, \$3.00. Enlargements 6" x 8", 10¢ per page. Library of Congress card number MicA54-504.

## LANGUAGE AND LITERATURE, LINGUISTICS

### A STUDY OF VERB FORM AND VERB USES IN CERTAIN AMERICAN WRITINGS OF THE SEVENTEENTH CENTURY

(Publication No. 7153)

Orville Lawrence Abbott, Ph.D.  
Michigan State College, 1953

The purpose of this thesis is to examine the verb forms and verb uses in American English of the seventeenth century.

As a basis for this study samplings were made from writings of the New England area from c. 1630 to c. 1700. The following types were considered; History and Narrative, writings on Religious

subjects, Diaries, Letters, writings of a legal character, and Poetry.

This thesis is divided into four chapters and a conclusion.

Chapter I, "Personal Endings", deals with the personal endings of verbs. Particular attention is given to the endings of the third person singular present, -th and -s. Tabulations indicate the relative frequency of these two forms. The conclusion drawn is that the -th form was ordinarily employed for language of a serious tone and the -s form in informal language. The poetry showed a preference for the -s forms. The stereotyped forms doth, hath, and saith were by far the most common -th forms. Some attention is given to the second person singular endings, levelings of the singular and the plural, and the form be in a non-subjunctive sense.

Chapter II, "Preterite and Past Participle of Strong and Weak Verbs", considers the regular and unusual forms of the preterite and past participle of strong and weak verbs. A number of variant forms were noted. In virtually all cases both the variant and the current form were found. The conclusion that a single form for the preterite and past participle of certain strong verbs had not been definitely established. The weak verbs had more nearly reached their present form.

Chapter III, "The Formal Subjunctive", considers the subjunctive as shown by the form of the verb itself. The formal subjunctive may usually be identified by the form be to the verb to be throughout the present tense, by the form were in the first or third singular of the verb to be, by the form have of the verb to have in the third singular, and by the -s less third singular of other verbs. The formal subjunctive was most commonly found in dependent clauses after certain subordinate conjunctions. An attempt is made to compare the use of formal subjunctive in English and French. A table shows the frequency of the formal subjunctive in relation to the number of pages examined. The conclusion is that the formal subjunctive was much more common in American English of the seventeenth century than today.

Chapter IV, "The Modals", discusses the modals shall and will, should and would, may and might, can and could, must and ought. Tables show the relative frequency of shall and will as future auxiliaries and would and should in conditional sentences. The loss of tense distinctions and the overlapping of meanings of various modals are commented on. Attention is called to the subjunctive nature of the modals. The conclusion is that the modals, with slight exceptions, were about the same in seventeenth century American English as today.

Microfilm copy of complete manuscript of 233 pages, \$2.91. Enlargements 6" x 8", 10¢ per page. Library of Congress card number MicA54-505.

# THE LINGUISTIC CATEGORY OF EMPHASIS IN COLLOQUIAL SPANISH

(Publication No. 7003)

Richard Beym, Ph.D.  
University of Illinois, 1952

The purpose of this study is to present a descriptive analysis of the (non-intonational) syntactical forms of the category of emphasis.

Colloquial texts were used as a starting point: patterns which through the context, seemed to be emphatic were gathered and tested with informants. If confirmed as emphatic, examples of the same patterns were collected from the texts and the informants. This study is not restricted to the Spanish of any particular region. The classification of this material resulted in two main patterns: the Element of Emphasis and Repetition.

An element of emphasis (EE) is a structurally superfluous element, has the meaning "emphasis," consists of one or more morphemes, and is used as a free or bound form with a sentence or part of a sentence. Elements of emphasis of a particular group may contrast as to lexical meaning; but this is of no concern here, since the present study deals with structural contrasts only. EE syntax has three divisions: the EE is used with a sentence, the EE is used with a verb, and the EE is used with a modifier of a verb or a noun.

Identical words (free, or bound to phrases, clauses, and sentences) or larger units are called identical elements. Identical elements, when not too distantly spaced in the speech of one or more speakers, are labeled a repetition series. Each repetition series contains: r, the structurally non-superfluous element to be repeated or anticipated; and R, the structurally superfluous element repeating or anticipating r. When it cannot be proven which of the identical elements is superfluous and which is non-superfluous, the initial one is (arbitrarily, perhaps) designated as R.

All patterns which were established as emphatic have one thing in common: the structural superfluity of one element. This represents the syntactic feature of the category of emphasis.

During the testing for the presence of the category of emphasis, word order was investigated. Exclusive of certain regional exceptions, position does not appear to express the category of emphasis. Position, however, may express the semantical category of contrast with the normal positions producing the meaning of non-contrast, and the less normal positions producing the meaning of contrast.

The category of emphasis is pertinent to the whole sentence rather than a part of it. Therefore, it is a suprasegmental category. Emphatic sentences are in contrasts with non-emphatic sentences. (The category of contrast is segmental: it is pertinent to only a part of the sentence.)

There is a definite relationship between the two forms in which emphasis may be expressed in Spanish: intonation and syntax. Apart from a certain amount of intonation always present, the two are

roughly equivalent. In other words, the category of emphasis may be expressed by intonational or syntactical means in free variation. For example, there is equivalence between the sentences: Me gusta el café dulce, with strong stress on the word dulce, and Me gusta el café bastante dulce, with its elements of emphasis, bastante.

Microfilm copy of complete manuscript of 159 pages, \$1.99. Enlargements 6" x 8", 10¢ per page. Library of Congress card number MicA54-506.

# THE EPITOME TROPORUM AC SCHEMATUM OF JOANNES SUSENBROTUS: TEXT, TRANSLATION, AND COMMENTARY

(Publication No. 6921)

Joseph Xavier Brennan, Ph.D.  
University of Illinois, 1953

The Epitome Troporum ac Schematum of Joannes Susenbrotus was the most definitive Latin treatise on the figures of speech composed during the Renaissance; from the time of its first appearance in 1541, it was also the most frequently printed and widely used of all such compilations. It might best be regarded, in fact, as the summarization and culmination of innumerable efforts from classical times to the Renaissance to define and codify the artistic devices by which language might be varied; its originality lay chiefly in the kind of synthesis it effected, in both content and form, from its numerous antecedents. Considered from the point of view of the Renaissance classroom and its special pedagogical needs, the Epitome was superior to all earlier works of this kind in several important respects. Though more complete than most of its rivals, it was nevertheless limited in scope to the more commonly used figures and terms. It defined each figure with admirable completeness, precision and clarity, and provided copious illustration for both study and imitation. By way of its illustrative material, furthermore, it frequently inculcated moral and religious precepts; by way of its organization, a respect for logical procedure. From its antecedents, in short, it effected a synthesis of all those elements most compatible with the methods and ideals of Renaissance education. It is for this reason that from the time of its first appearance the Epitome was apparently regarded as the definitive work of its kind, and printed at least twenty-five times before 1635. Its role was especially important in England, moreover, for there it became a standard class-book in the second half of the sixteenth century and continued to be printed long after it had evidently ceased to be used on the continent. As a standard schoolbook on the subject of eloquence, which English schoolboys—including Shakespeare—were compelled to memorize, it is a work of particular importance to students of English literature. It is of importance also insofar as it was used extensively by several of the English figurists, Sherry and Angel Day in



particular. There is good reason, then, for an English translation of this most important of all Renaissance treatises on the cultivation of eloquence.

The critical notes which have been subjoined to this translation are primarily a detailed analysis of the manner and extent of Susenbrotus' many borrowings. From these notes we learn that the bulk of his material was drawn from the rhetorical works of Erasmus, the *Rhetorica ad C. Herennium*, the *Institutio Rhetorica* of Quintilian, the Latin Grammar of Thomas Linacre, and the *Carmen de Figuris* of Antonius Mancinellus.

An account of the author's career and publications has also been added in an appendix. Into this section has been gathered considerable information, hitherto unpublished or unrelated, on both the author's works and his long but troublesome career as a teacher. In the light of this information many bibliographical problems in connection with the author's works have finally been resolved.

Microfilm copy of complete manuscript of 325 pages, \$4.06. Enlargements 6" x 8", 10¢ per page. Library of Congress card number MicA54-507.

#### AN EXPERIMENTAL STUDY OF THE ABILITY TO SELECT WORDS TO CONVEY INTENDED MEANING

(Publication No. 6941)

Thomas Edward Finfgeld, Ph.D.  
University of Illinois, 1953

A survey of historical and contemporary interest in language style reveals that the importance of the ability to select words to convey intended meaning is universally acknowledged. This ability has been defined in the present research as the ability to select words with Intentional-Adequacy. No previous study has investigated effective word-choice by analyzing the abilities of various persons to select words to convey intended meanings. The primary purpose of this study has been to investigate this ability and to provide an instrument for its measurement. The secondary purpose of this research has been to learn more about relationship of this ability to intelligence, verbal-reasoning ability, extent of vocabulary, sex, and advanced Speech training. Also, because this research is oriented toward learning more about "effective" word-choice, a study has been conducted to determine the relationship of the criterion of Intentional-Adequacy with other traditional criteria for evaluating "effectiveness" in word-choice.

Meaning has been defined behaviorally, and an instrument for the measurement of meaning has been applied. This instrument, the "Semantic Differential," is a combination of association and scaling techniques which has grown out of research on synesthesia. The hypotheses underlying the logic of this instrument define meaning as numerous experiential continua. Previous research has

demonstrated that this instrument is reliable and valid for measuring decoded meaning. The present research utilizes this instrument in this manner, but the logic of the Semantic Differential is also extended and applied to the encoding process. It is this extension and application which makes possible the quantification of the encoding process. The validity of this procedure has also been demonstrated. Instruments which are generally accepted and widely used have been employed for the measurement of intelligence, verbal-reasoning ability, and a test of Word-Choice Effectiveness has also been introduced.

The information gathered from administering these tests to a large number of subjects was analyzed, and the following conclusions have resulted from this analysis:

1. It is possible to measure the ability to select words to convey intended meaning, and people do vary in this ability. The variance among the sample of students tested indicates that this distribution approximates normality. Concepts are not equally difficult to describe, and the less desirable ones appear to be more difficult.
2. No statistically significant relationship exists between verbal-reasoning ability and the ability to select words with Intentional-Adequacy.
3. No statistically significant relationship exists between intelligence and Intentional-Adequacy ability.
4. No statistically significant relationship exists between the extent of a person's vocabulary and Intentional-Adequacy ability.
5. Intentional-Adequacy ability is not related to the sex of the word-chooser.
6. Persons who have received advanced training in Speech are not significantly better at the ability to select words with Intentional-Adequacy than persons without this advanced training.
7. A high relationship exists between words determined as effective by the criterion of Intentional-Adequacy and words determined as effective by experts applying traditional rhetorical criteria of effectiveness.

Microfilm copy of complete manuscript of 143 pages, \$1.79. Enlargements 6" x 8", 10¢ per page. Library of Congress card number MicA54-508.

## MATHEMATICS

### STRONG ORDERING IN THE SELF ADJOINT OPERATOR SPACE

(Publication No. 6916)

Robert Marvin Baer, Ph.D.  
University of Illinois, 1953

The lattice structure and vector lattice structure of the real linear space of continuous real functions defined over some topological space are well known. We are able to introduce a corresponding lattice structure into the non-commutative analogue of the function space, namely the real space of self adjoint operators with domain a given hilbert space. The device which does the trick is a partial ordering for these operators which is defined in a new way — in terms of the spectral resolution rather than in terms of the inner product. In terms of this ordering the operator space becomes a lattice, as does the real operator space contained in any (weakly closed) operator algebra with an identity.

A comparative study of the spectral ordering (called the strong ordering) with the usual orderings reveals that they are all equivalent for commuting operators, and that two operators which are comparative in the strong ordering are necessarily comparative in the inner product ordering. Thus we derive the result due to Stone which states that a bounded family of these operators in a commutative operator algebra have a least upper bound.

It is also found that the new partial ordering suggests a natural generalization of the notion of vector lattice, and the self adjoint space is studied from this more general point of view.

Microfilm copy of complete manuscript of 57 pages, \$1.00. Enlargements 6" x 8", 10¢ per page. Library of Congress card number MicA54-509.

### THE CONCEPT OF A RIGID BODY IN SPECIAL RELATIVITY

(Publication No. 6807)

Gerald Henry Fraser Gardner, Ph.D.  
Princeton University, 1953

There is a great deal of confusion about the use of the word "rigid" in relativity. The present investigation emphasizes that this confusion is avoided by a geometrical picture of the motion of a number of particles as a corresponding number of curves in space-time. Only a flat (Minkowski) space-time is considered. From this viewpoint, "rigidity" means certain geometrical constraints on these curves. This theoretical use of the word rigid must be distinguished from its physical use and any connection between the two is a matter for experiment.

Two types of rigid constraints may be distinguished. First, that in which all particles play an equal role, and second, that in which some particle, or set of particles, play a privileged role. Once privileged particles are introduced there is a host of possible definitions, and to avoid confusion on this account, only one such definition is mentioned. (Section 12.)

There are three main ideas developed. First, the motion of a rigid surface is investigated for some curious effects, these motions being given by the solutions of three non-linear partial differential equations for three functions of three variables. In this definition, each particle is of equal importance. Secondly, a concept of finite rigidity allows us to examine the analogous situation for a finite number of particles. A simple theorem about the triangulation of a surface makes the number of degrees of freedom of a rigid surface intuitively obvious. And thirdly, for the practical application of rigid motions, a definition of rigidity with a privileged particle is introduced.

In section 2, the physical meaning which may be attached to the Fitzgerald-Lorentz contraction is described and a formula suitable for later use established. The terminology of Minkowski space-time is introduced in section 3.

The non-linear partial differential equations which determine a family of parallel world-lines, termed a rigid motion by Born, are derived in section 4. These equations have been decisively investigated by Herglotz in the case that they form a congruence. If, however, the world-lines form an  $\infty^2$  family of curves, we have what might be termed the motion of a rigid surface. Some new properties of rigid surfaces are then described.

In section 5, the motion of a surface of revolution is illustrated, and in section 6, some rigid motions of a rotating disc are discussed. In section 7, it is shown that a toroidal rigid surface of revolution cannot be set in rotation.

Section 8 introduces a concept of rigidity for a finite number of particles, it being shown in section 9 how rigid bonds may be distributed among the particles so as to leave the system with six degrees of freedom. This shows that the small class of Born motions is due to the redundancy implicit in his definition.

In section 10, the discussion in the previous two sections is extended to the limiting case of an infinite number of particles, from which it appears that simply connected surfaces have six degrees of freedom, while multiply connected surfaces have only three.

Attention is directed in section 11 to the experiments of D. C. Miller. It was thought that existing experimental results might be reconciled by a suitable definition of rigidity, and as no existing theories served this purpose, that explained in section 12 was proposed. Section 13 derives the consequences for a



rotating body which performs this type of motion and some experimental predictions are indicated. This work is not given in detail as the experiments of R. W. Ditchburn indicate that, although the theory reconciles experiments up till 1952, it is not applicable in all generality. The need for a repetition of Miller's experiments is pointed out in the conclusion.

Microfilm copy of complete manuscript of 73 pages, \$1.00. Enlargements 6" x 8", 10¢ per page. Library of Congress card number MicA54-510.

### SOME THEOREMS ON N-PERSON GAMES

(Publication No. 6808)

Donald Bruce Gillies, Ph.D.  
Princeton University, 1953

An n-person game is defined in terms of a set-function satisfying only  $\sum v(i) \leq v(1, 2, \dots, n)$ . The dominion of an imputation is the set of imputations dominated by it, via any effective set. Games are called equivalent if there exists a 1-1 dominion-preserving transformation between their imputation spaces. A normal form is deduced, not necessarily unique, and it is shown that every set-function is game-equivalent to a superadditive one. Theorems are proved locating imputations which must be in all solutions or cannot be in any, and it is shown that a positive fraction of all games, and of all constant-sum games, have solutions. The so-called 0-1 normalization is used throughout, namely

$$\begin{aligned} v(S) &= 0 \text{ for the one-index sets} \\ v(I) &= 1 \text{ for the whole set.} \end{aligned}$$

A pyramid game is a game for which one distinguished player participates in all winning coalitions. Various properties are derived and it is conjectured that the further study of pyramid games might solve the question of whether every game has a solution.

Microfilm copy of complete manuscript of 35 pages, \$1.00. Enlargements 6" x 8", 10¢ per page. Library of Congress card number MicA54-511.

### BESSEL FUNCTIONS OF MATRIX ARGUMENT

(Publication No. 6813)

Carl Samuel Herz, Ph.D.  
Princeton University, 1953

Let  $\delta$  be a complex number with real part greater than -1 and  $\Lambda$  a positive-definite, mxm symmetric matrix. Following Bochner, we define a Bessel function  $A_\delta(\Lambda)$  such that for the Laplace transform taken over the set P of positive definite matrices one has

$$\int_P e^{-\text{tr}(\Lambda Z)} A_\delta(\Lambda) (\det \Lambda)^\delta d\Lambda = e^{-(\text{tr} Z^{-1})} (\det Z)^{-\delta - \frac{n+1}{2}},$$

the integral being absolutely convergent for all complex symmetric Z whose real part is positive definite. For the ordinary Bessel function one has  $J_\delta(x) = (\frac{1}{2}x)^\delta A_\delta(\frac{1}{4}x^2)$ . It is shown that  $A_\delta(\Lambda)$  can be extended to an entire function of  $\delta$  and complex symmetric  $\Lambda$ .

For real  $\gamma > -1$ , we consider the Hilbert space  $L_\gamma^2$  of functions f defined on P with the norm  $\|f\|_\gamma^2 = \int_P |f(\Lambda)|^2 (\det \Lambda)^\gamma d\Lambda$ . The Hankel transform  $g^\Lambda \sim \int_P A_\gamma(A R) (\det R)^\gamma f(R) dR$  is a real, unitary, self-adjoint transformation of  $L_\gamma^2$  onto itself. We show that if  $F(T)$  is a function of kxm matrices,  $k > m$ , which is radial, i.e.  $F(T) = f(\pi T' T)$ , then the Fourier transform of F corresponds to the  $\frac{1}{2}(k-m-1)$  - Hankel transform of f over  $P_m$ . The Bessel functions of half-integral order,  $A_\delta(\frac{1}{4}S'S)$ , turn out to be essentially the averages of  $\text{etr}(S'V)P(V)$  as V ranges over a suitable Stieffel manifold and  $P(T)$  is a harmonic polynomial which is determinantally homogeneous, i.e.  $P(TZ) = (\det Z) \times P(T)$ , Z being an mxm symmetric matrix. In particular, if S is an mxm matrix we define the generalized cosine and sine as the respective averages of  $\text{etr}(OS)$  and  $\text{etr}(PS)\det(-i0)$  over the full orthogonal group  $O_m$ . These give the Bessel functions of order  $-\frac{1}{2}$  and  $\frac{1}{2}$ . In addition, Poisson's formula for the Bessel functions is extended to matrix spaces.

A natural generalization of the Laguerre polynomials is given and a complete set of eigenfunctions for the Hankel transform thus obtained.

A Bessel function of the third kind,  $B_\delta(Z)$ , is defined as the Laplace transform of

$$e^{-\text{tr} \Lambda^{-1}} (\det \Lambda)^\delta \frac{m+1}{2}.$$

Most of the familiar integral formulae involving  $J_\delta$  and  $K_\delta$  can be generalized in terms of  $A_\delta$  and  $B_\delta$ ; some of these integral formulae bring in various types of hypergeometric functions defined on spaces of symmetric matrices.

Applications to lattice-point formulae are discussed.

Finally concrete expressions are given for  $A_\delta(\Lambda)$  when the argument is a 2x2 matrix.

The principal tool used is the uniqueness of Laplace transforms. Beyond this we use only: the fact that the Laplace transform defines an analytic function in the tube, i.e. generalized half-plane, of absolute convergence; Fubini's theorem; and the weakest form of Cauchy's theorem, namely that contour integrals of analytic functions are invariant under linear translations of the contour which do not pass over singularities of the integrand. Despite the elementary nature of these devices, the proofs of the generalized theorems are vastly simpler than those found in the literature on ordinary Bessel functions.

Microfilm copy of complete manuscript of 59 pages, \$1.00. Enlargements 6" x 8", 10¢ per page. Library of Congress card number MicA54-512.

## CONSTANT SPEED FLOWS

(Publication No. 6815)

Louis N. Howard, Ph.D.  
Princeton University, 1953

This dissertation is mainly concerned with an investigation of those steady flows for which the speed is constant on streamlines. It arose from an attempt to find a simple and natural proof of Hamel's theorem on this subject; this attempt was not successful, but I found several other results of interest, simpler proofs for various related problems, and certain partial generalizations of Hamel's Theorem.

To introduce the subject and indicate the reasons for interest in this particular problem, I give first an account of the flow pattern problem as it relates to the extent of uniqueness of flows with prescribed streamlines. Following this, the constant speed problem is formulated and discussed first in a general way and then in the three dimensional case. The problem is divided into two parts, of which the second is then solved in several steps. The first part of the problem is naturally formulated in terms of differential algebra. I discuss it somewhat in these terms and present an approach to solving it which makes use of the symmetry of the equations, but which nevertheless leads to computations too complex to carry out effectively.

Following this, the axially symmetrical case in three dimensions is investigated, first in a manner similar to that of Prim, and then, considering the problem in the large, by a completely different geometrical approach. This leads to a rather simple proof for the axially symmetrical problem, which is then generalized to treat the  $n$ -dimensional problem with axial symmetry.

Microfilm copy of complete manuscript of 49 pages, \$1.00. Enlargements 6" x 8", 10¢ per page. Library of Congress card number MicA54-513.

## BANACH SPACES AND THE PERTURBATION OF ORDINARY DIFFERENTIAL EQUATIONS

(Publication No. 6816)

George Hufford, Ph.D.  
Princeton University, 1953

Suppose that an autonomous system of differential equations has an isolated periodic solution of, say, period 1; and suppose that this system of differential equations is given a time dependent perturbation having the period  $T$  in time. The two periods, 1 and  $T$ , are not necessarily related in any way. Then under very general conditions there will exist in the neighborhood of the unperturbed periodic solution a single closed curve which has the property that it comprises a periodic set inasmuch as the entire curve repeats itself after a time  $T$ . It follows that the motion of points on this closed curve is described as motion on a two dimensional torus, and therefore it is subject

to the analysis of Poincaré and Denjoy and gives rise to almost periodic and subharmonic solutions.

The existence of this curve can be demonstrated by identifying the possible candidates with elements of a Banach space. The way in which the closed curves change after a time  $T$  can then be described as a transformation of the Banach space into itself, and the particular curve for which we are looking becomes a fixed point of this transformation. To find this fixed point, however, it is first necessary to formulate and prove suitable implicit function theorems for functions from one Banach space to another.

Microfilm copy of complete manuscript of 31 pages, \$1.00. Enlargements 6" x 8", 10¢ per page. Library of Congress card number MicA54-514.

## SEQUENTIAL DECISIONS INVOLVING THE CHOICE OF EXPERIMENTS

(Publication No. 6902)

Craig Ardith Magwire, Ph.D.  
Stanford University, 1953

In this paper we formulate, in a mathematically precise manner, the general sequential decision problem involving the choice of experiments and give an iterative method for obtaining Bayes solutions.

A statistical decision problem may be described as a two-person game where the two players are nature and the statistician. Nature possesses a class of distributions from which she selects one. It is assumed that when nature selects a distribution she simultaneously performs a grand experiment based on it. The outcome of this experiment is a point  $x$  in a space  $X$  where  $x$  is an infinite sequence  $x_1, x_2, \dots$ , and the  $x_i$ 's are entities which have specific meaning in any given problem. The statistician possesses a class of terminal actions  $A$  and a class of experiments which he can perform. It is assumed that the set of experiments is countable and that the same set is available at each stage of experimentation.

A sequential decision procedure is a function  $d$ , such that for a given  $x$   $d(x)$  is a pair  $[e_x, t(x)]$ , where  $e_x$  is a function which specifies what experiments to perform, in what order to perform them and when to terminate experimentation, and  $t(x)$  is an element of  $A$ . The statistical decision problem consists of finding a decision procedure  $d$  which will minimize the expected risk  $\rho(\xi, d)$ . The expected risk is given by

$$\rho(\xi, d) = \int_{\Omega} \int_X L[\omega, e_x, t(x), x] dP_{\omega}(x) d\xi(\omega),$$

where, for each parameter element  $\omega \in \Omega$ ,  $P_{\omega}$  is a probability distribution on a Borel field of subsets of  $X$ ,  $L[\omega, e_x, t(x), x]$  is the statistician's loss when he uses decision procedure  $d$  and  $x$  is the outcome of nature's experiment based on the distribution  $P_{\omega}$ , and  $\xi$  is an a priori probability distribution on a Borel field of subsets of  $\Omega$ .

In order to obtain an optimum decision procedure we replace the original statistical game by a new game



which is designated as an  $N$  game. For this  $N$  game we define an inner-truncated risk function  $N\rho^n$  with values  $N\rho^n(\xi, d; \zeta, u)$ . Here  $\xi$  is an a posteriori probability distribution given that a certain set of  $N$  experiments have been performed, the experiments having been selected according to the function  $\zeta$ , and their outcomes have been determined by the  $N$ -dimensional vector  $u$ . The right hand superscript  $n$  specifies that experimentation is truncated at  $n$ . Moreover, it is assumed that if, in the  $N$  game truncated at  $n$ , the statistician actually performs  $n$  experiments then the loss for making a terminal decision is zero.

The Bayes risk of an  $N$  game truncated at  $n$  is

$$N\hat{\rho}^n(\xi; \zeta, u) = \inf_d N\rho^n(\xi, d; \zeta, u).$$

It is shown that under specified restrictions this Bayes risk function is measurable and is the minimum of two quantities: the optimum expected stopping risk and the optimum expected continuation risk. The optimum expected continuation risk is expressed in terms of an  $N+1$  game truncated at  $n-1$ . It is further shown that  $\{N\hat{\rho}^n\}$  is a non-decreasing sequence of functions, hence has a limit, and this limit is the Bayes non-truncated risk. The associated decision procedure, or a procedure which has a risk that approximates this risk to any specified degree of accuracy, is characterized briefly as follows: If, at any stage of experimentation, there is a continuation which has smaller expected risk than the optimum stopping risk for that stage, the statistician performs the first experiment of an optimum continuation. If, on the other hand, there is no such continuation the statistician stops experimenting and takes an optimum terminal action.

Microfilm copy of complete manuscript of 36 pages, \$1.00. Enlargements 6" x 8", 10¢ per page. Library of Congress card number MicA54-515.

# QUADRATIC FORMS OVER LOCAL FIELDS

(Publication No. 6827)

Onorato Timothy O'Meara, Ph.D.  
Princeton University, 1953

Let  $F$  be a local field with ring of integers  $\nu_\rho$ . The theory of  $\nu_\rho$  - lattices over  $F$  is developed and yields the classical results on integral quadratic forms over the  $p$ -adic numbers.

In addition it is proved that any two maximal lattices in the same metric space are isometric. A lattice analogue of the Witt cancellation law for spaces is found. The usual results go through at the odd primes. If 2 is a prime, a complete characterization of the lattices in a given metric space is given. This is then expressed independently of any canonical basis.

The ramified case - i.e. 2 splits - is investigated, and it is shown that two forms are equivalent if and

only if they are equivalent modulo a high power of  $\pi$ ; this reduces the problem of equivalence over a local field to a finite one.

Lattices of unit determinant are investigated in the ramified case: any two totally integral lattices of unit determinant, in the same metric space, are equivalent if they represent the same numbers modulo  $\pi^{2e+1}$ .

Microfilm copy of complete manuscript of 77 pages, \$1.00. Enlargements 6" x 8", 10¢ per page. Library of Congress card number MicA54-516.

# ADDITIVE AND NON-ADDITIVE SET FUNCTIONS

(Publication No. 6837)

Lloyd S. Shapley, Ph.D.  
Princeton University, 1953

The properties of real-valued functions on a Boolean ring are investigated with the aid of three types of limiting processes, based on (1) directed sets of partitions, ordered by refinement; (2) finite trees of successive partitions, ordered by extension; (3) directed sets of finite subrings, ordered by inclusion. Through (1) a theory of integration is developed. The integral takes the form of a linear operator, projecting general set functions onto their additive parts. Integration of real functions with respect to non-additive "measures" then becomes possible. Through (2) a notion of deviation from additivity for non-additive functions is obtained, leading to a canonical decomposition:  $f = f^+ + f^- + f^0$  of every function of finite deviation into its superadditive, subadditive, and additive parts. Through (3) certain new linear operators, called "imputations," are defined. These are also projections from general set functions to the additive functions; they have application to the problem of equitable distribution in economics and to the theory of  $n$ -person games.

Microfilm copy of complete manuscript of 73 pages, \$1.00. Enlargements 6" x 8", 10¢ per page. Library of Congress card number MicA54-517.

# CONFIDENCE REGIONS FOR THE LOCATION OF THE VERTEX IN QUADRATIC REGRESSION

(Publication No. 6846)

David Lee Wallace, Ph.D.  
Princeton University, 1953

The purpose of many experimental investigations is to determine a relationship between a response and several determining variables of the observed process, and particularly to estimate values of the determining variables for which the average response is a maximum. Procedures are considered for confidence region estimation of the location of the maximum (vertex) of a regression surface in which the average response is a quadratic function of the determining variables.

The hypothesis that  $\lambda = (\lambda_1, \dots, \lambda_p)$  is the vertex of the quadratic regression surface is a general linear hypothesis, i.e. a set of  $p$  linear equations in the regression coefficients in which the coefficients in the equations are linear functions of the  $\lambda_i$ . A confidence region procedure for  $\lambda$  based on the standard (F)-test is available and possesses several 'optimum' properties, but is shown to be unsatisfactory in practice.

If each of the single linear hypotheses making up the general linear hypothesis is tested separately,  $p$  different confidence regions, usually bounded by hyperboloids, are obtained. The intersection of these is a confidence region for  $\lambda$  with bounded level. Approximations to the intersection region by parallel-epipeds and polyhedra are discussed.

Some requirements for usable multidimensional confidence regions are discussed and proposed procedures are rated primarily by these requirements.

A compound procedure is presented which provides a way of utilizing a posteriori information. Machinery is provided for the investigation of the effects of some deviations from the assumed model on the levels of confidence procedures.

Microfilm copy of complete manuscript of 156 pages, \$1.95. Enlargements 6" x 8", 10¢ per page. Library of Congress card number MicA54-518.

#### ON THE BACKWARD EXTENSION OF MOMENT SEQUENCES

(Publication No. 7071)

Fred Marion Wright, Ph.D.  
Northwestern University, 1953

In this paper we first consider simultaneously the problems of embedding a given S-sequence  $\{\mu_n\}$  in an S-sequence  $\{\lambda_0, \lambda_1 (= \mu_0), \lambda_2 (= \mu_1), \dots\}$  and of determining when a given S-sequence  $\{\lambda_n\}$  is such that the sequence  $\{\mu_0 (= \lambda_1), \mu_1 (= \lambda_2), \dots\}$  is also an S-sequence. The principal result obtained for terminating S-fractions is as follows, with a similar result being obtained for non-terminating S-fractions.

**THEOREM 1:** If

$$(1) \quad \sum_{n=0}^{\infty} \mu_n w^{n+1} \sim \frac{c_1 w}{1} + \frac{c_2 w}{1} + \dots + \frac{c_{2k} w}{1},$$

$$(c_i \neq 0, i = 1, 2, \dots, 2k-1)$$

and

$$(2) \quad \sum_{n=0}^{\infty} \lambda_n w^{n+1} \sim \frac{a_1 w}{1} + \frac{a_2 w}{1} + \dots + \frac{a_{2k+1} w}{1},$$

$$(a_i \neq 0, i = 1, 2, \dots, 2k),$$

then

$$(3) \quad \lambda_n = \mu_{n-1}, (n = 1, 2, \dots)$$

if and only if there is a set of parameters  $(g_1, g_2, \dots, g_{2k+1})$  satisfying

$$(4) \quad g_i \neq 0, (i = 1, 2, \dots, 2k); g_{2j+1} \neq 1, (j = 1, 2, \dots, k-1)$$

and in terms of which the S-fractions in (1) and (2) have the forms

$$(5) \quad \left\{ \begin{aligned} & \frac{g_1 g_2 w}{1} - \frac{g_2 g_3 w}{1} + \frac{(1-g_3)g_4 w}{1} - \frac{g_4 g_5 w}{1} + \frac{(1-g_5)g_6 w}{1} \\ & - \dots - \frac{g_{2k-2} g_{2k-1} w}{1} + \frac{(1-g_{2k-1})g_{2k} w}{1} - \frac{g_{2k} g_{2k+1} w}{1} \end{aligned} \right.$$

and

$$(6) \quad \left\{ \begin{aligned} & \frac{g_1 w}{1} - \frac{g_2 w}{1} + \frac{g_2(1-g_3)w}{1} - \frac{g_3 g_4 w}{1} + \frac{g_4(1-g_5)w}{1} - \frac{g_5 g_6 w}{1} \\ & + \dots + \frac{g_{2k-2}(1-g_{2k-1})w}{1} - \frac{g_{2k-1} g_{2k} w}{1} + \frac{g_{2k}(1-g_{2k+1})w}{1}, \end{aligned} \right.$$

respectively.

We then apply the S-fraction transformations of the preceding paragraph to the problem of extending backward a given S-moment sequence  $\{\mu_n\}$ . Most of the results obtained relative to the backward extension of a given S-moment sequence  $\{\mu_n\}$  such that the S-fraction expansion of the formal power series  $\sum_{n=0}^{\infty} \mu_n w^{n+1}$  is non-terminating are already known (see "On the Pade Approximants Associated with the Continued Fraction and Series of Stieltjes" by H. S. Wall on pages 91-116 of *Transactions of the American Mathematical Society*, vol. 31(1929)); therefore our main interest here in these results lies in their simplified development by means of the S-fraction transformations of the preceding paragraph. The principal results obtained relative to the backward extension of a given S-moment sequence  $\{\mu_n\}$  such that the S-fraction ex-

pansion of the formal power series  $\sum_{n=0}^{\infty} \mu_n w^{n+1}$  is

terminating are new, however, and are given by the following two theorems.

**THEOREM 2:** An S-moment sequence  $\{\mu_n\}$  such that

$$(7) \quad \sum_{n=0}^{\infty} \mu_n w^{n+1} \sim \frac{c_1 w}{1} + \frac{c_2 w}{1} + \dots + \frac{c_{2k-1} w}{1},$$

$$(c_i \neq 0, i = 1, 2, \dots, 2k-1)$$

cannot be extended backward.

**THEOREM 3:** If  $\{\mu_n\}$ ,  $(n = 0, 1, 2, \dots)$ , is an S-moment sequence such that

$$(8) \quad \sum_{n=0}^{\infty} \mu_n w^{n+1} \sim \frac{c_1 w}{1} + \frac{c_2 w}{1} + \dots + \frac{c_{2k} w}{1},$$

$$(c_i \neq 0, i = 1, 2, \dots, 2k),$$

then the sequence  $\{\lambda_0, \lambda_1 (= \mu_0), \lambda_2 (= \mu_1), \dots\}$  is an

S-moment sequence if and only if



$$(9) \lambda_0 \geq - \left\{ \frac{c_1}{c_2} + \frac{c_1 c_3}{c_2 c_4} + \dots + \frac{c_1 c_3 \dots c_{2k-1}}{c_2 c_4 \dots c_{2k}} \right\}.$$

Next we use the results of the preceding paragraph in considering the problem of embedding a given Hausdorff moment sequence  $\{\mu_n\}$  in a Hausdorff moment sequence  $\{\lambda_0, \lambda_1 (= \mu_0), \lambda_2 (= \mu_1), \dots\}$ , where  $\lambda_0$  is the only real number which may permit backward extension of this latter Hausdorff moment sequence. Here we shall define a Hausdorff moment sequence to be a sequence  $\{\mu_n\}$ ,  $(n = 0, 1, 2, \dots)$ , of real numbers such that there is a monotone nondecreasing function  $g(t)$  on the interval  $[0, 1]$  satisfying

$$(10) \mu_n = \int_0^1 t^n dg(t), \quad (n = 0, 1, 2, \dots).$$

Finally, we consider the problem of extending backward a given positive definite Hamburger moment

sequence, and we develop some sufficient conditions, each stronger although more complicated than the well-known Carleman criterion, for such a Hamburger moment sequence to be a determinate Hamburger moment sequence. In lieu of a continued fraction transformation theory such as was used in our discussion of S-moment sequences, in the development of conditions relative to the backward extension of a given positive definite Hamburger moment sequence  $\{\mu_n\}$  we use the determinants  $\Delta_n$ ,  $(n = 0, 1, 2, \dots)$ , and certain polynomials  $\{X_p(z)\}$  and  $\{Y_p(z)\}$ ,  $(p = 0, 1, 2, \dots)$ , related to the J-fraction expansion of the formal power series  $\sum_{n=0}^{\infty} \mu_n / z^{n+1}$ . However, these results correspond quite well to results obtained in our discussion of S-moment sequences.

Microfilm copy of complete manuscript of 88 pages, \$1.10. Enlargements 6" x 8", 10¢ per page. Library of Congress card number MicA54-519.

## MINERALOGY

### HEAVY DETRITAL MINERALS IN STREAM SANDS OF THE EASTERN SIERRA NEVADA, BETWEEN LEEVINING AND INDEPENDENCE, CALIFORNIA

(Publication No. 6910)

Daniel Reeves Shawe, Ph.D.  
Stanford University, 1953

Heavy detrital minerals were studied from many samples collected along the east slope of the Sierra Nevada between Leevining, near Mono Lake, and Independence, California. Although granitic igneous rocks predominate, intermediate and basic igneous rocks, metamorphic rocks, volcanic rocks, and glacial debris underlie some parts; pegmatites are rare.

Field work was done in the summer of 1950, and laboratory work carried out at Stanford University during the academic years 1950-51 and 1952-53.

The purpose of the investigation was to determine distribution and concentration of radioactive and other heavy detrital minerals in stream sands, as well as the stability and composition of minerals in the sands, and effect of source, environment, and sampling on mineral frequencies.

Examination of the heavy minerals required mounting of appropriate fractions of each sand and of some of the rock samples, and preparation of thin sections in some instances, for microscopic study,

and purification of minerals for chemical, X-ray, and spectrographic analyses. Identification of minerals was thus insured and distribution of trace elements among the minerals was indicated.

Minerals identified and described in detail are fluorite, chalcopryrite, pyrite, molybdenite, pyrolusite, hematite, ilmenite, leucosene, rutile, cassiterite, anatase, brookite, magnetite, carbonate, scheelite, monazite, apatite, biotite, chloritoid, hypersthene, ferrosalite, augite, several amphiboles, the epidote group, tourmaline, two garnets, zircon, thorite, forsterite, vesuvianite, andalusite, staurolite, and sphene. Heavy sands are made up of suites, or combinations of suites, of these minerals, representing plutonic (chiefly granitic) igneous, volcanic, regional metamorphic, and contact metamorphic rock types, and the samples' compositions correspond to associated rock types indicated on a generalized geologic map. Examination of rock specimens corroborated the nature of the source of many of the minerals.

An area of higher than average radioactivity was detected near the town of Bishop; radioactivity is due to thorium and uranium present chiefly in monazite and ilmenite, and to some extent in allanite, thorite, and zircon. Granites, and to a lesser extent quartz monzonites, cropping out in the area of abnormal radioactivity, are the main source of radioactive minerals. This area is also characterized by an unusual relative abundance of brookite and tourmaline.

Solution etching of some minerals, notably forsterite, augite, and hypersthene, is extensive, and it is believed that the process has been effective in decreasing the frequency of such minerals away from their sources.

As a result of the study of heavy detrital minerals the following conclusions are drawn: (1) a study of heavy detrital minerals from stream sands can give a comprehensive picture of the geology, and although it cannot accomplish many of the results of areal geologic mapping it may supplement data so obtained; (2) although no commercial occurrences of radioactive minerals were found, the field and laboratory techniques are valid for such prospecting; (3) extensive labor involved in heavy detrital mineral studies can be reduced to such an extent that results warrant the time expended; (4) a study of the frequencies

of heavy detrital minerals in stream sands may indicate extent of solution and provide useful information concerning the role of weathering in the geochemical cycle; (5) in areas of limited transport of detritus, such as the Sierra Nevada, surrounding source rocks have the greatest influence on compositions of stream sands, and effects of solution and sorting have progressively less influence; (6) sampling is not reliable enough to expect exact duplication of results if repeated, nor is it reasonable to limit it to certain precise conditions; however, sampling with a standard technique provides results of sufficient accuracy to allow valuable geologic conclusions.

Microfilm copy of complete manuscript of 200 pages, \$2.50. Enlargements 6" x 8", 10¢ per page. Library of Congress card number MicA54-520.

## MUSIC

### THE EARLY DEVELOPMENT OF INSTRUMENTAL MUSIC IN SELECTED PUBLIC HIGH SCHOOLS OF SEVEN NORTH CENTRAL STATES

(Publication No. 7038)

Cyrus Paul Harper, Ph.D.  
Northwestern University, 1953

This study was an investigation of instrumental music as it developed in selected public high schools of seven North Central states of the United States. Essentially it consisted of a presentation of historical facts, some of which heretofore had never been compiled and written in a single work, and others of which possibly were recorded here for the first time. There was a definite attempt to present these facts in their proper relationships to the development as a whole.

The school instrumental music movement has had a tremendous growth since about 1910. This growth helped to warrant the present dissertation, which was designed to be an historical source in the field of instrumental music education.

In the selection of approximately sixty public high schools, the chief aim was not to investigate an exhaustive number of schools but rather to study a fair sampling of those which were active in instrumental music. Three factors were the relevant criteria: (1) early development, (2) continuous development, and (3) good quality of development. Seven states were selected: Illinois, Indiana, Iowa, Michigan, Minnesota, Ohio, and Wisconsin.

This dissertation includes chapters on the development of instrumental music in the individual high schools, the cultural background, the role of the instrument manufacturers, and the general growth of school instrumental music in the North Central states. Concomitants of the school instrumental movement are represented by the contest-festival

history, the National Band Clinic, the National High School Orchestra, and the summer music camp movement.

The sources may be classified under three principal headings: (1) printed materials, (2) questionnaires, and (3) interviews. The interviews were conducted with various retired teachers and lay townspeople in thirty-one communities, seven pioneers (not now connected with any school in the study), and executives of four instrument manufacturing establishments. Many photographs were taken to lend authority to the historical data.

The center of the early development of instrumental music in the public high schools of the United States was in the North Central area.

It was shown that by 1948-49 there were 486,877 secondary school students who were enrolled in band and 121,407 in orchestra in the United States. Also in 1948-49 seven North Central states had 148,441 secondary school students enrolled in band and 34,432 in orchestra. These figures indicate that slightly less than one-third of all the secondary school band and orchestra members in this country were located in only seven North Central states during that year. During the same year it was estimated by the *Encyclopedia Britannica* that the population of those seven states was about twenty-three percent of the total population in the United States. Thus the North Central states continued to have a large proportion of the school instrumental activity, even in the light of the population figures.

The development of orchestras was less than that of bands in each of the seven North Central states selected for study. In 1948-49 the national ratio of band-to-orchestra students was about four to one. In each of the seven states, with the exception of Ohio, the band-to-orchestra ratio was more out-of-balance than the national ratio. There was shown to be a need for an orchestral development which would balance that



of the band. It was hoped that the emphasis would be placed upon a well-rounded program of music education for every public school, regardless of size.

It was believed that this study of the North Central area could become one basis for a future comprehensive history of school instrumental music in the entire country.

Microfilm copy of complete manuscript of 278 pages, \$3.48. Enlargements 6" x 8", 10¢ per page. Library of Congress card number MicA54-521.

**STYLISTIC CHARACTERISTICS IN A CAPELLA  
COMPOSITION IN THE UNITED STATES, 1940-1953:  
AS INDICATED BY THE WORKS  
OF JEAN BERGER, DAVID DIAMOND,  
DARIUS MILHAUD, AND MIKLOS ROZSA**

(Publication No. 7047)

Robert M. Larson, Ph.D.  
Northwestern University, 1953

In selecting a text the composer ordinarily seeks material of high literary quality with ideas that stimulate his creative imagination. The poems selected may not be a kind which obviously 'cries out to be sung' since the contemporary composer is often looking for a text that provokes a modern dissonant treatment. Composers seldom adhere strictly to the text repetitions of the poem, but rather adjust the words to fit the musical materials.

The setting of the text is usually syllabic with the neumatic and melismatic styles appearing less often. While examples of direct imitations or word-painting are rare, composers occasionally attempt to express or symbolize what the text suggests. The metrical accent of the bar is an important factor in the proper accentuation of the text. A key word or syllable is generally found on the first beat of the measure.

Ternary form is most often employed as the general structural plan of a movement. Sonata, binary, rondo, variation and motet forms appear less frequently. The most characteristic modification of these traditional forms is the changed appearance of the return or recapitulation. Repetition, transposition and sequence are still important unifying factors, although some composers tend to eliminate exact repetitions of a passage or section.

A notable tonal characteristic is the great freedom with which composers interchange the various modes or scales. Although the music may at times impart a certain vagueness of tonality, this is ordinarily due to the presence of polytonality or polymodality rather than atonality. Dissonance is used expressively to emphasize a key word or to give a whole phrase a particular color. It also plays a leading role in the achievement of climaxes. On the other hand it may merely exist as the functional result of linear procedures. Composers are inclined to treat dissonance as a free entity which does not require resolution.

In order to make the individual lines stand out, composers use fewer but thicker lines, i.e. lines doubled at the unison, or moving in parallel thirds, fourths, fifths, sixths, triads or any combination of these elements. The number of independent lines is frequently reduced to two. Polytonality and polymodality are favorite methods of achieving differentiation between the lines.

Composers vary considerably in their use of polyphonic forms and devices. While some use them infrequently, others use them in every work. The two-part canon at the octave is the most important form. Fugato and stretto are important devices.

The contemporary composer has sought to unshackle music from the 'tyranny of the bar-line.' Frequent changes of meter are his most effective means of achieving this freedom. These changes also serve to inject new rhythmic life into the music through an interchange of duple and triple pulses, to achieve a closer association between text and music in regard to word accents, and facilitate the reading problem for the singer.

The shorter thematic type of melody is generally preferred. Main themes tend to be conjunct and lyric while contrasting themes are usually more disjunct and angular with considerable wide skips and octave transpositions. These new lines often move about with a freedom of interval, mode and range that has been termed 'instrumental' or 'unvocal.' The modern composer does not hesitate to place greater demands upon the singer's vocal equipment and musicianship than has been required heretofore if desirable expression is the result.

Microfilm copy of complete manuscript of 288 pages, \$3.60. Enlargements 6" x 8", 10¢ per page. Library of Congress card number MicA54-522.

## PHILOSOPHY

### WILLIAM JAMES'S THEORY OF RELIGIOUS KNOWLEDGE

(Publication No. 6810)

John Beattie Harrington, Ph.D.  
Princeton University, 1953

William James proposed in *The Varieties* "to defend . . . 'experience' against 'philosophy' . . . ." In his view, data, facts, evidence, in religion as elsewhere, are equipped to carry their own authentication and these formed the materials of his empiricism. In his attempt to link empiricism with religion, James selected, as the object of study, "the feelings, acts and experience of individual men." These are of primary concern, for James, while "theologies, philosophies, and ecclesiastical organizations" are secondary and derived.

The dissertation analyzes this religious empiricism as expressed in three inter-related phases: pragmatic experimentalism with emphasis on practical results, voluntaristic fideism stressing belief as fulfillment of emotional impulses, and experientialism emphasizing immediate awareness, the latter exemplified, for James, in mysticism with its moments of "insight" and "feeling."

James attempted to develop analogous structure between the verifiable hypotheses of the sciences and the postulates of religion by appeal to data within a "science of religions." But he did not distinguish clearly between the perspectives of the scientific observer and those of the experiencer with his personal interests. Results of this failure, in the form of ambiguities, vagueness and circular arguments, emerge in distinctive ways within each phase of his thought.

According to James, experimental knowledge performs two functions: first, satisfaction of interests, pointing towards fideism; and, second, substitution of ideas or verifiable hypotheses for actual experiences which they intend, pointing towards experientialism. James did not distinguish these functions. He confused "radical pragmatism," in which satisfaction is equivalent to "truth," with "moderate pragmatism," in which verifiability defines a test of truth while the criteria of truth lie elsewhere. In criticism, the dissertation maintains that the test of hypotheses empirically verifiable does not apply in religion. We must rely on the test of fulfillment of emotional and moral interests.

"Radical fideism" merges the truth-test with the emotional-test as cases of successful working. "Moderate fideism" distinguishes these tests. James's own view remains ambiguous. The "will to believe" notion is self-contradictory; for to will to believe is not actually to believe. The thesis states that fideism makes positive contribution within religious experience providing it is defined in terms not of knowledge as such but of psychological and moral attitudes as preconditions of knowledge.

Experientialism includes psychological, epistemological and metaphysical perspectives of James's appeal to immediate experience. But the term experience is ambiguous. There are narrower meanings in which conclusive evidence is the testimony of sheer data. But, in religion especially, James found it difficult to separate an immediate datum from fideistic or theoretical interpretation. The latter is experience in the broader sense. The critical issue is that a sheer datum cannot of itself constitute knowledge. James did not make this sufficiently clear. The dissertation suggests positively that immediate experience may perform a legitimate function in religion if conceived, not as the whole of knowledge, but as a "moment" of insight.

Mysticism, for James, is the example, par excellence, of immediacy in which knower and known become identical. The mystic, in his attempt to communicate, does not state literal truth but expresses his insights in symbolic language of music and poetry. The critical issue is: did James show how the isolated aloneness of the mystic may be reconciled with the contexts of social responsibility and intellectual knowledge? The critical view is maintained that James failed to establish, in unequivocal terms, that, although there are individualistic mysticisms, "pure mysticism" is meaningless; for mysticism develops within contexts of groups and movements with their accepted values and bodies of interpretive materials. Mystical insights are not infallible signs of what is the case, but must be subjected to appropriate tests within specific frames of reference.

Microfilm copy of complete manuscript of 265 pages, \$3.31. Enlargements 6" x 8", 10¢ per page. Library of Congress card number MicA54-523.

### A STUDY IN PERCEPTION

(Publication No. 6822)

Cecil Garland Stewart McKeown, Ph.D.  
Princeton University, 1953

The attempt is made to mark out recurrent and, at the same time, the essential features within one type of cognitive situation only — man's perceiving of common-sense things. In the several sections, A to E, problems associated with such simple perceptual situations are alone examined.

In Section A, which follows the brief Introductory Remarks, the two chief factors in the perceptual situation are instanced: the apprehending and the content in awareness.\*

In Section B, the apprehending is examined in detail. Attention and two modes of interpreting, (s) and (p), are investigated. Though mode of interpreting (p) is shown to have close affinities with perceiving as



Price, for example, conceives it, mode of interpreting (s), it is said, is not to be confused with sensing. Extensive arguments are introduced to establish the view that the doctrine of sensing, adopted by Broad, Price and Lewis, is not supported by the alleged evidence for it. The two modes of interpreting are exhibited in the context of three perceptual situations. In the third of these, I show at some length how differently two persons — one accepting sensing and the other the mode of interpreting sense-contents which I posit as alternative — might examine a perceptual situation. Three possible objections to my theory are met. Then, by means of four sorts of perceptual situation, I establish the fact that attending tends to vary independently of the two modes of interpreting. Throughout, my belief is that interpreting is everywhere in perceptual life, that an immediate confrontation devoid of any interpreting never occurs. The contention is that the two modes of interpreting, (s) and (p), occur as they do in adult life by reason of concepts. The concept, it is argued, is not a static, isolable entity. Nor do images fully reveal it. As criterion in mind, it determines a range of experiences. The language of dispositions is adopted to discuss it. A special problem — the alleged inference in perception — is investigated: I do not find rewarding the attribution of inference to those perceptual situations in which, without hesitation, we take for granted that such and such is the case.

In Section C, the content in awareness is discussed. All sense-data, it is said, enjoy the same phenomenal status in our experience. Nonetheless, for reasons given, certain orders — the visual and tactual, for example — are chosen as especially significant; and the point is made that other qualities — “form-qualities” — are important in perceptual experience, though little regard has been paid to them, heretofore. Depth and distance are examined at length. Sense-data are distinguished both from sensations (with special reference to writings by Price) and from surfaces (with special reference to writings by Moore). The problem of “unnoticed sense-qualities” is investigated at length: no evidence is discovered as conclusive against the theory that the sense-datum is just the noticed, the discriminated.

In Section D, our belief in an external world is examined. My theory is compared with one, on the surface very similar to it, the Multiple Relation Theory of appearing of Dawes Hicks. Propositions to which we are committed in accepting material things are stated. I inquire into the process by which our belief in particular material objects arises; and justification for this belief is examined, both in the context of traditional sense-datum discussion and in that of contemporary argument as to whether or not material-object propositions are certain. The conclusion is that propositions attesting to the existence of particular material objects, though never completely verifiable, are, nonetheless, justifiable. Finally, the relation of sense-data to material objects is briefly stated.

In Section E, the vagueness of all empirical language is stressed. Vagueness is distinguished from ambiguity, generality and “open texture.” A

recommendation that we should look neither for “the basic facts” nor for “the basic language” is made; and an impossible ideal — that of exactness — for natural (as distinct from formal) languages is noted. The characteristics and value of the sense-datum language are investigated. Its functions are marked out from those of the material-object language. Though the two languages are not equivalent — categoricals may not be “reduced” to hypotheticals — the sense-datum language provides a most helpful “translation” of the material-object language, for reasons cited.

Microfilm copy of complete manuscript of 297 pages, \$3.71. Enlargements 6" x 8", 10¢ per page. Library of Congress card number MicA54-524.

#### ENDS AND MEANS, WITH REFERENCE TO TELEOLOGY IN GENERAL

(Publication No. 6834)

David John Sachs, Ph.D.  
Princeton University, 1953

The aim of this dissertation is to clarify the problem of the justification of means by ends. To begin with, there is a discussion of teleology in general. This is undertaken, in the main, because a number of philosophers have tried to define teleology in such a way that their definitions might apply to ends-means situations as a sub-class, so to speak, of teleological phenomena. If they had succeeded in so doing, then, presumably, some important characterization — applicable to ends-means situations as a species thereof — would have been discovered.

The object of the first two chapters is to render such hopes suspect. The effort made in this direction is of two kinds. First, there is a detailed criticism of several definitions of teleology. All are found to be overly stringent, in that they include some phenomena usually considered teleological, but exclude others. Secondly, there is an attempt to indicate something of the two extraordinary variety of teleological phenomena. In these two ways, some plausibility may have been given to the contention of the second chapter: there is nothing distinctive in common to all the phenomena that are often characterized as “teleological.”

Following this, there is a discussion of the concept of purpose. It was felt that something should be said about this notion before attempting to analyze that of ends and means. The major claims made concerning purposes are: behavior may be purposeful, at least in the sense implied by its being motivated in a certain way, without its being thus intended. A man may be ignorant of some of his purposes; he may be mistaken concerning them, even though much of his behavior can be construed as measures adapted to the end of which he is ignorant, or concerning the existence of which he is mistaken. These points are made in anticipation of one of the claims of the fifth chapter, namely, that the terms “ends” and “means” are not strictly limited, in their application to planned behavior. Nonetheless, it is recognized that, in the main,

they are thus applied, viz., to planned action, and the recognition of this, in turn, seemed to warrant a fairly detailed analysis of the concept of plans. The fourth chapter is devoted to this analysis; what is there said of plans, may all be said of the utilization of means to effect ends. That is, with the qualification that the utilization be deliberate.

In the fifth chapter, it is urged that, for something to be an end, it must satisfy two "requirements:" (1) that someone either seek after, or intend to seek after it, and (2) at least partly for its own sake. It is not denied that the term "end" might be intelligibly used in relation to all teleological phenomena. But it is emphasized that to employ the term "end" on so generous a scale would subject its customary, and relatively limited, meaning to a misleading and useless enlargement.

The sixth and final chapter, on the justification problem, tries to sustain several contentions. (1) When the moral question, "Does the end justify the means?", is asked, it refers to the employment of morally doubtful or objectionable means. (2) Those who hold that ends can never justify the means may do so in a variety of ways. Some, for instance, maintain that morally objectionable acts are, regardless of any consequences, unjustifiable. Others hold that no good can come from the use of such means, or, never enough to outbalance the evil done. (3) Those who hold that the end may sometimes justify taking recourse to morally objectionable means are not necessarily committed to a theory which would, in practice, subvert morality. This last is argued, first, on the basis that the maxim, "the end justifies the means," does not supply a rule for most conduct — that it is addressed, as it were, to special circumstances; and secondly, on the ground that, although the maxim may be misconstrued in a way which tends to abuse, it is in this regard, no more to be deplored than recognized forms of legal defence. Finally, (4), it is claimed that the maxim's applicability need not be discriminated sharply from that of the advice: choose the lesser evil.

Microfilm copy of complete manuscript of 175 pages, \$2.19. Enlargements 6" x 8", 10¢ per page. Library of Congress card number MicA54-525.

A STUDY OF PHILOSOPHICAL ANALYSIS,  
WITH SPECIAL REFERENCE TO RUSSELL'S  
ANALYSIS OF THE EXTERNAL WORLD

(Publication No. 6836)

Jerome Arthur Shaffer, Ph.D.  
Princeton University, 1952

Toward the end of becoming clearer about the nature of philosophical analysis, a study is made of Bertrand Russell's analysis of the external world. First, the analysis itself is examined, and then the question of how we are to interpret and understand such an analysis is discussed.

Russell's analysis starts with the indication of

certain "defects" in the commonsense view of physical objects and in the ordinary ways of talking about physical objects. Russell charges that our commonsense knowledge is (1) cocksure, i.e., makes unjustifiable claims about the existence and nature of physical objects, (2) vague, i.e., not sufficiently definite nor precise, and (3) self-contradictory, i.e., containing certain contradictions about (a) physical objects and their appearances, and (b) the nature of physical objects on the commonsense view vs. the scientific view.

When the nature of these "defects" has been made clear, the task of the philosopher, according to Russell, is to remove them by exhibiting physical objects as logical constructions out of a set of highly indubitable entities.

The entities Russell selects are sense-data, the importance of which arises from the logical impossibility of our being deceived about them. The difficulties in supplying a generic definition of "sense-datum" are discussed, and it is decided that we can only define "sense-datum" as anything which falls into one of three species, the appearances of physical objects, the appearances of complex physical phenomena like the sky, thunder, etc., and psychological phenomena like after-images, dreams, hallucinations, etc. Such a definition avoids the difficulties and perplexities involved in common-quality definitions and ostensive definitions. The nature of judgments based upon sense-datum acquaintance is discussed, and the objection that the distinction between sense-data and judgments is invalid and the objection that there can be no judgments validated by a single experience are examined and held to be illegitimate. Two theories of Russell's concerning wherein lies the validity of judgments based upon sense-datum acquaintance are rejected, and it is seen that the validity of such judgments depends only upon the proper use of language and other skills like counting.

The task of reconstructing our knowledge out of sense-data is then examined. The reconstruction in terms of the Theory of Descriptions is discussed and seen to be most inadequate. The theory of Logical Constructions is then examined and its relations to Russell's principle of Reducibility to Acquaintance and the Principle of Verifiability are discussed; either principle would validate the theory of Logical Constructions but neither is seen to be tenable in the form required to justify the theory of Logical Constructions.

Returning to the "defects" in our commonsense views, I show that the first is not a defect in common sense but a defect in certain philosophical theories, and therefore Russell's solution is gratuitous. The second alleged defect is seen to be something beyond the province of philosophy. The third charge results from two mistakes, taking commonsense to blur a distinction which it does not (although a philosophical theory, Naive Realism, does blur it), and taking commonsense to offer a scientific theory about physical objects. Thus Russell's analysis cannot be said to be a correction of defects in common sense.

It remains to be discussed what sense can be made of Russell's analysis. Two interpretations, that Russell is presenting a theory about the fundamental



entities referred to when we talk about physical objects, and that Russell is presenting an explication of what we mean when we talk about physical objects, are rejected. The third interpretation, that Russell is providing the replacement of a notion which troubles us by a notion which does not, is the most plausible. It is shown that the proposed replacement

is less troubling in some respects but more so in others and that the search for a "replacement" is itself an illegitimate endeavor.

Microfilm copy of complete manuscript of 245 pages, \$3.06. Enlargements 6" x 8", 10¢ per page. Library of Congress card number MicA54-526.

## PHYSICS

## PHYSICS, GENERAL

## ELECTRON DISTRIBUTIONS IN IRRADIATED N-TYPE SEMICONDUCTORS

(Publication No. 7051)

Harold Glaser, Ph.D.  
Northwestern University, 1953

The rate of production of conduction electrons is dependent on the space coordinates because the light intensity inside the crystal varies in space. The rate of loss of conduction electrons is usually expressed as a constant transition probability multiplied by a function of the number of conduction electrons and the number of holes. This expression should be assumed to hold only locally, since in general the density of conduction electrons and the density of holes will be functions of the coordinates and cannot be replaced by their average values. The purpose of our calculations was to take this effect into account.

The calculations can be applied to the Demer effect and also applied to the experiments of L. Gildart and A. Ewald (*Phys. Rev.*, 83, 359, 1951).

We assume the crystal to be a plane plate of finite thickness in the x-direction but infinite in extent in the other two dimensions. We use the following notation:

- $n(x)$  = negatively charged particle density
- $p(x)$  = positively charged particle density
- $E(x)$  = electric field intensity in the interior of the semiconductor
- $\mu$  = electron mobility
- $D$  = diffusion constant
- $e$  = magnitude of electronic charge
- $\epsilon$  = specific inductive capacity due to the filled traps and electrons not in the conduction band
- $I_0$  = intensity of incident radiation
- $h\nu$  = energy of incident quanta
- $q$  = quantum efficiency
- $\beta$  = recombination probability
- $\alpha$  = linear absorption coefficient
- $L$  = thickness of plate.

Differentiation with respect to  $x$  is denoted by primes.

If we assume that the radiation is absorbed

exponentially and the recombination follows the bimolecular law, we have at equilibrium

$$\mu E(x)n(x) = Dn'(x) \quad (1a)$$

$$E(x) = \frac{e}{\epsilon} [p(x) - n(x)] \quad (1b)$$

$$(I_0 \alpha q / h\nu) e^{-\alpha x} = \beta p(x)n(x) \quad (1c)$$

$$E(0) = E(L) = 0. \quad (1d)$$

The potential can be fixed so that

$$\phi(0) = 0, \quad E(x) = -\phi'(x). \quad (1e)$$

The temperature may be introduced through the Einstein condition

$$\mu/D = e/kT.$$

If we define

$$v(x) = -\mu\phi(x)/D - \alpha x/2, \quad \gamma = \frac{1}{2} \log(I_0 \alpha q / h\nu) - \log n(0)$$

then the above system of equations (1) can be reduced to the non-linear differential equation

$$v''(x) = \Gamma e^{-\alpha x/2} \sinh(v + \gamma) \quad (2a)$$

$$\Gamma = (2e^2 / \epsilon kT) (I_0 \alpha q / h\nu \beta)^{1/2}. \quad (2b)$$

The boundary conditions on  $v(x)$  are

$$v(0) = 0, \quad v'(0) = v'(L) = -\alpha/2. \quad (2c)$$

To get approximate solutions to equation (2a) with the boundary conditions (2c), we use the variation principle

$$\delta \int_0^L \left[ \mathcal{L} - \frac{d}{dx}(vv') \right] dx = 0 \quad (3a)$$

$$\delta v(x) \text{ arbitrary, } \delta v'(0) = \delta v'(L) = 0 \quad (3b)$$

$$\mathcal{L} = v'^2/2 + \Gamma e^{-\alpha x/2} \cosh(v + \gamma). \quad (3c)$$

Trial functions are chosen to have the fixed slope  $(-\alpha/2)$  at  $x = 0$  and  $x = L$  to satisfy equations (2c) and (3b). The value  $v(0)$  is not fixed. After the variation is carried out, parameters introduced through the trial functions are adjusted to satisfy the condition  $v(0) = 0$ . This then permits a determination of the constant  $\gamma$ .

Approximate solutions to equation (2a) with the boundary conditions (2c) were obtained using the variation principle and the following set of approximating functions:

$$v(x) = -\frac{\alpha}{2}x + a_1, \quad 0 \leq x \leq x_1$$

$$v(x) = -\frac{\alpha}{4}x + a_2, \quad x_1 \leq x \leq x_2$$

$$v(x) = a_3, \quad x_2 \leq x \leq x_3$$

$$v(x) = -\frac{\alpha}{4}x + a_4, \quad x_3 \leq x \leq x_4$$

$$v(x) = -\frac{\alpha}{2}x + a_5, \quad x_4 \leq x \leq L.$$

The above set of approximating functions contains nine parameters, four of which are eliminated by demanding that  $v(x)$  be continuous in  $0 \leq x \leq L$ . The five remaining parameters were used as variational parameters. After the variation was carried out,  $a_1$  was set equal to zero, permitting the determination of  $\gamma$ .

Computations were made for  $\alpha = 10^5 \text{ cm}^{-1}$  and  $L = 2 \text{ mm}$ . We get a  $1/2$ -power dependence of photocurrent on intensity. From the data of Gildart and Ewald we determine the capture cross-section of a hole for an electron in cadmium sulphide to be  $2.3 \times 10^{-20} \text{ cm}^2$ .

The variation principle approximation shows a deviation from the  $1/2$ -power dependence of photocurrent on intensity for small intensities, but the deviation is not large enough for conclusions to be drawn. Values of the Dember potential agree qualitatively with values cited in the literature, but measurements on cadmium sulphide are needed.

Microfilm copy of complete manuscript of 34 pages, \$1.00. Enlargements 6" x 8", 10¢ per page. Library of Congress card number MicA54-527.

#### THE COMPOUND REFLECTION X-RAY MICROSCOPE

(Publication No. 6907)

Howard Hunt Pattee, Jr., Ph.D.  
Stanford University, 1953

X-ray microscopes offer several important advantages over light or electron microscopes. X-rays allow better resolution than light and do not require vacuum mounting of the specimen as do electron microscopes, nor do x-rays tend to damage the specimen. X-rays have a wide range of penetrating power, and they also permit elemental chemical analysis of the specimen by absorption spectroscopy.

The basic problem in the development of x-ray microscopes is the design of mirrors which must operate at very small grazing angles of incidence (0.01 to 0.03 radians). The geometrical aberrations tend to increase as the rays become more oblique to the mirror surface, and at these grazing angles of incidence the aberrations may become so extreme that the conventional definitions lose their significance. New approaches to the optical design are then necessary.

Using only spherical mirrors the resolution at the center of the field will be limited by the spherical

aberration to about 0.1 micron for focal lengths of the order of 1 cm. The resolution a small distance from the center of the field will be limited by coma in a simple microscope, and by curvature-of-field in a compound microscope. Coma can not be corrected in the simple microscope.

A compound optical system using aspherical mirrors can produce an aplanatic focus, i.e., a point free from aperture defect and coma. Furthermore, a second object point which is located a finite distance from the aplanatic point can be imaged with no aperture defect by a suitable choice of aperture stop and mirror contour.

The complete design of a practical x-ray microscope requires considerably more than a theoretical optical system. Optimum values for essential parameters such as x-ray wavelength, instrument scale, magnification, and maximum angle of incidence must be chosen with great care. For example, the scale of the instrument will depend on the accuracy to which mirrors can be figured. Also, the maximum angle of incidence will be determined by the properties of the thin metallic films which are used to coat the mirror surfaces. The mechanical mounting of mirrors and specimen must be extremely rigid, the tolerance being of the order of the desired resolving distance. A small, intense x-ray source is also necessary if exposure times are to be short.

Microfilm copy of complete manuscript of 184 pages, \$2.30. Enlargements 6" x 8", 10¢ per page. Library of Congress card number MicA54-528.

#### A THEORETICAL ANALYSIS OF ACOUSTIC WAVE MODES IN LAYERED LIQUIDS

(Publication No. 6840)

Jack Leslie Stone, Ph.D.  
Princeton University, 1953

The investigation is devoted to a theoretical study of acoustic wave fields arising from a single frequency point source in slightly viscous, layered liquids. The acoustic fields are derived in their modal representation for three particular shallow water configurations: one- and two-layered media bounded by perfectly reflecting planes, and the two-layered semi-infinite medium. The resulting mode forms are compared with respect to orthogonality, completeness, finiteness, modal identity and discreteness, physical representations, and "cut-off." Particular attention is given to an analysis and extension of the research of Dr. C. L. Pekeris on the two-layered semi-infinite medium. A derivation of the general power and energy orthogonality conditions, based on studies of electromagnetic wave modes, is also presented.

Microfilm copy of complete manuscript of 77 pages, \$1.00. Enlargements 6" x 8", 10¢ per page. Library of Congress card number MicA54-529.



# RELATIVISTIC THEORY OF EXTENDED CHARGED PARTICLES

(Publication No. 6847)

Marvin A. Weinstein, Ph.D.  
Princeton University, 1953

The problem of formulating a classical relativistic theory of charged particles which interact with the electromagnetic field over an extended region of space-time is studied, and it is shown how a general theory of this type can be developed in terms of the notion of an extended 4-dimensional deformable (or rigid) body. The kinematical theory of the general extended 4-dimensional body is developed in terms of an arbitrary (continuous) transformation group in four dimensions, the properties of the conserved covariant charge-current distribution corresponding to such a body are discussed, and equations of motion are derived from a Lagrangian formalism. As examples of the theory, the McManus-Peierls electron (here described as a spherically symmetrical 4-dimensionally rigid body which undergoes only space-time translations) and the Lorentz electron (here described as a flat spinning 4-dimensionally rigid hyper-disc) are considered. The present theory enables one to give a consistent description of the Lorentz electron for arbitrary accelerations, and it is shown that motions in which the acceleration in the rest frame exceeds  $c^2/a$ , where  $a$  is the radius of the particle, can be interpreted as representing the creation and annihilation of pairs of particles of equal and opposite charge. Finally, it is shown how the above description of the extended charge can be made covariant in the sense of the theory of general relativity.

Microfilm copy of complete manuscript of 192 pages, \$2.40. Enlargements 6" x 8", 10¢ per page. Library of Congress card number MicA54-530.

## PHYSICS, ELECTRONICS & ELECTRICITY

### A METHOD FOR REDUCING THE DOPPLER WIDTH OF MICROWAVE SPECTRUM LINES

(Publication No. 6825)

George S. Newell, Jr., Ph.D.  
Princeton University, 1953

A method for reducing the Doppler width of microwave spectrum lines is developed which is potentially capable of increasing the resolution of microwave spectrographs and the long term stability of spectrum line stabilized frequency standards by at least one, and probably two, orders of magnitude.

The smearing effect of the Doppler shifts due to the spread in molecular velocities is removed by effectively selecting for observation only those

molecules of the gas sample which have a velocity component in the direction of observation lying in a predetermined narrow range. This is accomplished by using a system of grids in a rectangular cell to impose a quasi-static electric (or magnetic) field in the gas which has a form similar to a running wave of the radiation field, but which is so constructed as to propagate at a typical molecular velocity.

A full description of the effect of this perturbing field leads to complicated sideband resonances similar to those observed in ordinary sinusoidal Stark modulation. But if the modulation is weak a simple physical picture emerges: Those molecules which are stationary in a coordinate system moving with the perturbing wave will have a resonant frequency which is shifted by the Stark (or Zeeman) effect according to the local value of the field. The phase of their response to the radiation field — or what is equivalent, the refractive index of the medium — is thus a periodic function of position in the moving frame. If the wavelength of the perturbing field is chosen to satisfy the Bragg condition constructive interference is possible between the waves scattered throughout the volume of the gas, leading to a reflection of the incident radiation in close analogy to the Bragg reflection of x-rays from a moving crystal. Molecules which are not at rest in the moving frame will show phase shifts which tend to average to zero so that constructive interference is not possible. Quantitatively it is found that the velocities of the molecules which contribute to the reflection are automatically limited to a range such that the spread in Doppler shifts is equal to the line width resulting from all other sources. Thus in reflection a response with a width limited only by collisions or saturation is picked out of the normal Doppler broadened envelope.

The method has been tested using the ammonia  $J = K = 3$  inversion line at 1.25 cm. A 7 to 10 fold reduction from the normal Doppler width of 72 kc. (full width at half maximum) has been obtained, giving lines 7 to 10 kc. broad corresponding to an equivalent "Q" of 5 to 7 million. The apparatus is described in detail together with suggested improvements to achieve greater convenience and higher resolution.

The only theoretical limitation to the resolution which may be attained by this method is the line width due to collisions of the molecules with the walls of the container. The theoretical line shape differs from the usual Lorentz profile and in theory velocity selection should give rise to a cusp-like line which would permit a resolution higher than that predicted from the width at half maximum. However, intensity considerations indicate that only small gains can be achieved in this direction. The most promising approach to higher resolution is through an increase in cell size. On scaling the cell the ultimate resolution is proportional to the linear dimensions while the signal power remains constant. Quantitative estimates indicate that for ammonia a line width of 0.7 kc. is feasible, corresponding to a "Q" of 60 million.

Microfilm copy of complete manuscript of 225 pages, \$2.81. Enlargements 6" x 8", 10¢ per page. Library of Congress card number MicA54-531.

### HALL EFFECT IN INSULATING PHOTOCONDUCTORS

(Publication No. 6974)

Alfred Guillou Redfield, Ph.D.  
University of Illinois, 1953

A technique has been developed for measurement of the electronic Hall mobility in insulating photoconductors which avoids difficulties due to space charge effects and crystal nonuniformities. The crystal is illuminated with short bursts of light so that negligible space charge is built up during the time of illumination. The Hall electrodes are of unconventional design. The theory and practice of the technique are described at length.

Measurements using this technique have been made on several diamonds. Both electrons and holes are found to contribute to the photoconductivity, making interpretation of the data difficult. It is tentatively concluded that the electronic mobility varies as  $T^{-3/2}$  and is about  $1800 \text{ cm}^2/\text{volt-sec.}$  at  $300^\circ \text{K.}$  For holes it is concluded (with far less certainty) that the mobility also varies as  $T^{-3/2}$  and is somewhat greater than  $1200 \text{ cm}^2/\text{volt-sec.}$  at  $300^\circ \text{K.}$  These observations are consistent with the deformation potential theory of electronic mobility.

Measurements on several alkali halides confirm that the charges excited from F centers are electrons. The mobility in NaCl, KCl, KBr, and KI is one to three hundred  $\text{cm}^2/\text{volt-sec.}$  at  $100^\circ \text{K.}$  and decreases rapidly with increasing temperature. The observed mobilities are in agreement with the recent theory of Low and Pines, assuming electronic effective masses of about one half of the free electron mass.

Microfilm copy of complete manuscript of 131 pages, \$1.64. Enlargements 6" x 8", 10¢ per page. Library of Congress card number MicA54-532.

### THE KINETICS OF ANODIC FILMS WITH AN APPENDIX ON THE SCHLIEN MICROSCOPE

(Publication No. 6984)

Lee Palmer Stephenson, Ph.D.  
University of Illinois, 1953

Although the phenomena associated with anodic films are widespread in nature, there is a general lack of understanding of their kinetics. The present work represents an investigation of some of the fundamental mechanisms governing the growth and decay of CuCl films on Cu anodes in 2N HCl. In addition to usual electrochemical methods, this work employs the purely physical methods of microscopy, cinematography of the anode surface, and schlieren cinematography of the anolyte.

It is found that the non-temporal features of typical make transients can be represented as "characteristic curves" in a current-voltage plot. An important temporal feature, the time which must elapse

before the current drops, is conveniently expressed in terms of the dependence of  $Q$  upon  $i_0$ , where  $Q$  is the electrical charge that must be passed through the cell before the current drops, and  $i_0$  is the initial current. During the course of a transient, both  $\epsilon$ , the characteristic potential of the anode, and  $r - r_0$ , the resistance of the CuCl layer, are found to vary. Moving pictures of the anode show that the layer begins to form at many randomly distributed points soon after electrolysis begins. It then proceeds to grow in a sideways manner until the entire anode is covered. As the last bit of free surface is covered, there is an abrupt increase in  $\epsilon$  followed closely by an abrupt increase in  $r$ , with the result that the cell current drops in two distinct steps. Motion pictures of the anolyte, taken with a schlieren microscope, show the progressive depletion of HCl as it is consumed by the anode reaction. They also show the production of the anode product (presumed to be  $\text{HCuCl}_2$ ) and the convection currents resulting from density variations within the diffusion layer. Because it permits measurements of the thickness of the diffusion layer, the schlieren microscope makes calculation of the diffusion current possible even when convection exists. The transient phenomena which follow the interruption of the steady state current are investigated using the methods outlined above, and an interesting electro-optical effect associated with the layer is described. Theoretical expressions are derived for the potential of a heterogeneous electrode, the dependence of  $Q$  upon  $i_0$ , and for the characteristic curves. The agreement between theory and experiment is generally very good. An appendix devoted to the schlieren microscope discusses its usefulness in electrochemical investigations, the theory and practice of its operation, and the limitations imposed upon its use as a quantitative instrument.

Microfilm copy of complete manuscript of 129 pages, \$1.61. Enlargements 6" x 8", 10¢ per page. Library of Congress card number MicA54-533.

### PHYSICS, NUCLEAR

#### NUCLEAR INDUCTION SIGNALS BELOW THE NOISE LEVEL

(Publication No. 6894)

David Harrison Garber, Ph.D.  
Stanford University, 1953

A photographic method is developed for obtaining nuclear induction signals below the noise level. The signal-to-noise ratio may be small because of low concentration in the sample of the atomic nuclei being considered, as in the case of gaseous or small samples. In the associated electronic circuits the noise is well-known to be essentially random.

To detect a signal below the noise level, both signal and noise are displayed on the fluorescent screen of a cathode-ray oscillograph, using a linear time sweep synchronized with the nuclear resonance



modulation field. A photographic exposure of the screen is taken which includes several thousand sweep traces, each contributing a line that represents the signal and the random noise. Since the sweep is synchronized with the modulation field, the signal occurs at the same position on each trace; however, on any one trace the signal is hidden by the noise. The large number of superposed noise traces is represented on the photograph by a horizontal ribbon. The small recurrent signal occurs at the top and bottom edges of the noise ribbon.

Because of the random distribution of the noise, the ribbon is most dense in the horizontal region across the middle. If the number of traces is sufficiently large, the trace density is approximately uniform for an arbitrary horizontal section across the ribbon parallel to the middle region of greatest density. Such a section is made photographically using high contrast film which provides a narrow transition region from high to low photographic density. The location of this region is determined by a narrow range of values for trace density. The photographic contrast obtained is further enhanced by consecutive contrast copying of the noise ribbon photograph, thereby making the transition region even more narrow. By adjustment of appropriate photographic parameters one determines the region of density across which is drawn the line of contrast. These parameters include choice of film, photographic exposure, and procedures of photographic development with subsequent contrast copying. The parameters are adjusted so that the final noise ribbon has a half-width approximately equal to the root-mean-square value of the noise.

If the number of traces is not sufficiently large, the edges of the noise ribbon, as delineated by the choice of photographic parameters, are not horizontal straight lines. Instead the edges show residual fluctuations because of incomplete statistical averaging of the random noise. It is this residual fluctuation against which the signal must be detected. In order to increase the signal-to-noise ratio one must use longer time exposures; the improvement is proportional to  $\sqrt{N}$ , where  $N$  is the number of traces.

Another method of increasing the signal-to-noise ratio is to use a cathode-ray beam effectively elongated in the vertical direction; this helps to smooth irregularities in the edge of the noise ribbon. The beam is elongated by applying a 25 kilocycles per second triangular wave to the oscillograph vertical deflection terminals.

As an experimental demonstration for achieving detection of signals below the noise level, photographs are shown of signals from the hydrogen nuclei in propane and in hydrogen gas at room temperature and one atmosphere pressure. The signal from hydrogen gas represents a signal-to-noise ratio improvement of the order of 1000.

Construction details and a theoretical analysis are presented for a split transmitter coil which provides a radio-frequency magnetic field for the nuclear induction experiment. Axial field homogeneity is maximized by proper choice of coil dimensions, analogous to the requirements for Helmholtz coil design.

Microfilm copy of complete manuscript of 66 pages, \$1.00. Enlargements 6" x 8", 10¢ per page. Library of Congress card number MicA54-534.

#### AN INVESTIGATION OF THE ALPHA-GAMMA ANGULAR CORRELATION IN THE DECAY OF ThC (Bi<sup>212</sup>)

(Publication No. 6814)

John Wesley Horton, Ph.D.  
Princeton University, 1953

Recently discovered inadequacies of the Gamow theory of alpha decay have made it important to determine by measurement the angular momenta of the alpha particles emitted in the decay of certain nuclei which contain an odd number of protons or neutrons. No such determinations have heretofore been made.

By the method of angular correlation, we have approximately determined the angular momenta carried off by the two most energetic alpha particle groups in the alpha decay of the odd-odd nucleus ThC(Bi<sup>212</sup>) to ThC'' (Tl<sup>208</sup>). A 6 mev alpha particle and a 40 kev gamma ray following it were detected by two scintillation spectrometers. Coincidence measurements were consistent with a correlation function  $1 + 0.230 \cos^2 \theta$ . This result is in disagreement with that of a previous investigator, but is predicted theoretically.

From our experimental result, and from an analysis of the beta decays of the ground states of ThC and ThC'', we conclude that the spin and parity of ThC is 1- and that the spin and parity of the 40 kev and ground states of ThC'' are respectively either 3+ and 4+ or 4+ and 5+.

From these assignments, values of angular momenta of the alpha particles may be obtained. When the effect of angular momenta is taken into account, it appears that the decay constants of the two alpha particle groups studied are reasonably well accounted for on the basis of a Gamow theory which includes the effect of the angular momentum.

Microfilm copy of complete manuscript of 178 pages, \$2.23. Enlargements 6" x 8", 10¢ per page. Library of Congress card number MicA54-535.

#### THE SCATTERING OF TWO DIRAC PARTICLES

(Publication No. 6821)

James Macoun Kennedy, Ph.D.  
Princeton University, 1953

This paper presents a step along the road to a phenomenological theory of high energy nucleon-nucleon scattering. It has been shown by Wigner and Eisenbud\* that a large class of collision problems dealing with particles whose wave functions are solutions of the Schroedinger equation may be conveniently characterized by a function

$$R(E) = \int_{\lambda} \frac{\gamma_{\lambda}^2}{E_{\lambda} - E}$$

where  $E$  is the energy of the system, and  $E_{\lambda}$  and  $\gamma_{\lambda}$  are energy independent parameters. The possibility

of describing the scattering of a single Dirac particle by a centre of force in the same way has been demonstrated by Goertzel<sup>†</sup>. The present investigation is devoted to showing that the scattering of two particles by their mutual interaction, when their wave functions satisfy the Dirac equation may also be described in this way.

The main usefulness of the function  $R(E)$  is that in effect it enables the separation of the description of scattering phenomena into two parts. The one depends on the short range forces which are usually unknown, and gives the parameters  $\gamma_\lambda$  and  $E_\lambda$  in the expression for  $R$ . The other depends only on the properties of the particles at large distances, and gives the connection between the energy dependence of  $R$  and the observable cross sections. From a practical point of view, the second part must be assumed known in order to derive any useful information about the forces from the behavior of  $R$ .

It is therefore assumed throughout the greater part of this work that beyond the range of nuclear forces there is no interaction between the particles. (In Chapter 11 it is shown that there is no objection in principle to relaxing this assumption and allowing long range forces provided the quantum mechanical equations containing these forces can be solved.) The first large section is concerned with an examination of the solutions of the quantum mechanical equations under this restriction. It is shown that for a given angular momentum  $j$  there are four independent solutions, a singlet state with parity  $(-1)^j$  and three triplet states, one of which has parity  $(-1)^j$  while the others have parity  $(-1)^{j+1}$ . Each of these functions has sixteen components, arising from the four spinor indices for each particle. The various solutions are written out explicitly in Chapter 3; in addition to these, solutions corresponding to incoming and outgoing waves, and to plane waves are presented.

These wave functions are used in Section III to examine the consequences of a short range interaction, that is assumed to be confined to a sphere of radius "a". By using an analogue of Green's Theorem to relate integrals over the interior of this sphere to integrals over its surface, the salient features of the interaction are replaced by boundary conditions on the external solution that ensure that it may be continued inside the sphere without becoming singular at the origin. This is accomplished by defining two linearly independent solutions  $D$  and  $V$  (for each of the four types of solution mentioned above), and finding the condition on  $R$  such that

$$D(E) + R(E) V(E)$$

is an admissible wave function.

In certain respects the working out of this program is similar to the analogous calculation for the problems cited earlier. However, there are several rather important differences. The first of these is that the definition of the "standard" solution  $V$  is completely determined (apart from normalization) by the requirement that  $R$  be as simple a function of energy as possible. Second, and in part a consequence of the previous point, the Hermitian boundary value problem that defines a complete set of orthonormal eigenfunctions for the internal region is also completely

determined. Third, it is shown that while a simple connection between the solutions  $D$  and  $V$  on the surface  $r = a$  is a convenience, it is not essential to the success of the theory. This last point is of importance in the discussion of the triplet states of parity  $(-1)^{j+1}$ , where such a connection is shown to be impossible.

The main result is that the scattering of two Dirac particles may be described in terms of a matrix:

$$R_{GH}(E) = hc \sum_{\lambda} \frac{\gamma_{\lambda G} \gamma_{\lambda H}}{E_{\lambda} - E}.$$

The indices  $G$  and  $H$  refer to the four states for a given angular momentum. Under assumptions that the parity and symmetry of the wave functions are unchanged by the interaction, many of the off-diagonal elements vanish.  $R$  also depends, of course, on the value of the angular momentum  $j$ ; both the  $\gamma_{\lambda}$  and the  $E_{\lambda}$  will be different for different  $j$ . In Chapter 10, it is shown that there is no loss of generality in assuming that  $R$  is real. It is also proved that  $R$  is an odd function of energy:  $R(-E) = -R(E)$ . The connection between  $R$  and the collision matrix  $U$ , which is intimately related to the scattering cross section, is obtained.

The relation question of meson production in high energy nucleon-nucleon collisions is discussed briefly in Chapter 12, but it is concluded that configuration space methods are probably unsuitable for this problem.

\*Ref. 13. E. P. Wigner L. Eisenbud.

Phys. Rev. 72. 29 (1947).

†Ref. 24. G. Goertzel. Phys. Rev. 73. 1463 (1948).

Microfilm copy of complete manuscript of 119 pages, \$1.49. Enlargements 6" x 8", 10¢ per page. Library of Congress card number MicA54-536.

## THE PHASE-SHIFT ANALYSIS OF NUCLEAR CROSS-SECTION DATA

(Publication No. 6962)

Harry Lustig, Ph.D.  
University of Illinois, 1953

The calculation of phase-shifts from experimental data has usually involved "matching" of differential cross-section data at a number of angles equal to the number of assumed non-zero phase-shifts, followed by minimization of the errors at other angles. It is possible to derive  $n$  simultaneous equations for  $n$  assumed phase-shifts by calculating  $n$  "moments" of a suitable expression for the differential cross-section. We have derived such a theoretical expression for the problem of single channel elastic scattering of charged particles with channel spin 1/2, and performed the integrations. For each particular experimental problem, the cross-section data are to be integrated numerically. Then  $n$  simultaneous equations are obtained which may be solved for  $n$  phase-shifts. As an example of this method, we have analyzed proton-alpha scattering data at an incident energy of 5.78 mev. and obtained values for five assumed phase-shifts.

Microfilm copy of complete manuscript of 61 pages, \$1.00. Enlargements 6" x 8", 10¢ per page. Library of Congress card number MicA54-537.



# AN EXPERIMENTAL INVESTIGATION OF POSITRONIUM

(Publication No. 6830)

Thomas Alexander Pond, Ph.D.  
Princeton University, 1953

Unsuccessful attempts were made to detect positronium formed by the passage of positrons through collodion-gold films, and the moderation of positrons in liquid argon.

Experiments on positrons moderated in gases at one atmosphere showed that an appreciable fraction of the positrons annihilate from the triplet state of positronium. An inhomogeneous magnetic field was used to trap positrons from a cyclotron-prepared source into a small volume of gas. The two photon coincidence rates at 180 degrees originating in this volume were compared when the gas was pure, and when it contained a trace of nitric oxide. In the first case, the three photon, triplet positronium annihilations escape detection, while in the second, exchanges with the nitric oxide's unpaired electron convert the triplet positronium to the two photon, singlet decay, because the lifetime of the singlet system is very much shorter than that of the triplet. In the gases studied, the differences in these rates indicate that 20 to 30 % of the positrons form positronium before annihilating.

The magnetic field does not influence the triplet,  $m_j = \pm 1$  states, but it introduces an amount of singlet wave function directly proportional to the field and inversely proportional to the fine structure splitting between the singlet and triplet ground states into the  $m_j = 0$  state. It was thus possible to determine the fine structure splitting by measuring the fraction of positrons that annihilated from the triplet state with three photons at various values of the trapping field. The moderating gas used was nitrogen. The splitting observed is in satisfactory agreement with the theory, and the measurements of others.

Microfilm copy of complete manuscript of 156 pages, \$1.95. Enlargements 6" x 8", 10¢ per page. Library of Congress card number MicA54-538.

## THE RADIATIONS FROM $\text{Ce}^{144}$

(Publication No. 6972)

Ira Pullman, Ph.D.  
University of Illinois, 1953

One of the important tasks of present day experimental nuclear physics is the determination of decay schemes and the assignment of spins and parities to the energy levels of the different radioactive nuclei. This information is needed to verify current theories on nuclear structure, such as the Mayer shell theory, and to serve as a basis for a more complete theory.

Many of the uninvestigated radioactive isotopes have quite complicated decay schemes. It was therefore thought advisable to investigate several isotopes with emphasis on the potentialities of the available

techniques. In this the nuclei  $\text{In}^{114}$ ,  $\text{Hg}^{203}$ , and  $\text{Ce}^{144}$  were investigated and parts of their decay schemes resolved.  $\text{In}^{114}$  and  $\text{Hg}^{203}$  were chosen to demonstrate and test the techniques although their decay schemes are relatively simple. The  $\text{Ce}^{144}$  decay is complex and has led to considerable disagreement by various investigators. Various types of detecting apparatus were used including scintillation counters (with coincidence circuits), proportional counters, and a magnetic field lens spectrometer. Much of the time spent on instrument development was concerned with improving the resolution of the scintillation counters.

The following paragraphs summarize the nuclear data measured in the course of the present investigation.

In  $\text{In}^{114}$  the K conversion coefficient of the 50 day, 192 keV isomeric transition was found to be  $2.3 \pm 0.3$ . This, together with previously reported values for the K/L ratio and the half-life, confirms the assignment of the multipolarity as E4. The fraction of transitions from the isomeric state going via K-capture to  $\text{Cd}^{114}$  was found to be  $0.04 \pm 0.01$ . These experiments verified the reliability of absorption-pulse height analysis techniques.

In  $\text{Tl}^{203}$  the K and the L plus M conversion coefficients of the 280 keV gamma transition (which follows the beta decay of  $\text{Hg}^{203}$ ) were measured to be  $0.13 \pm 0.05$  and  $0.04 \pm 0.02$ , respectively. These agree within experimental error with previously reported values and indicate the transition to be a mixture of M1 (magnetic dipole) and E2 (electric quadrupole). The errors are large due to poor resolution in the electron counter but the analysis of the electron spectrum was sufficiently good to justify the further application of coincidence-pulse height analysis techniques, particularly since the resolution was later improved.

In  $\text{Ce}^{144}$  a 24% beta branch was established with an energy of 175 keV in addition to the already known beta ray of 309 keV (76%) which goes to the ground state of  $\text{Pr}^{144}$ . The most prominent gamma radiation which had been identified as a 134 keV transition was shown to be an M1 transition by measuring its conversion coefficients. The 134 keV transition follows the 175 keV beta ray about 70% of the time while a cascade of an 81 keV gamma ray to a 54 keV level takes about 25% of the time. The remaining transitions consist of a cascade of 100 keV and 34 keV gamma rays. More than half of the decay of the 54 keV state goes via a 13 keV and 41 keV gamma ray cascade. Conversion coefficient measurements of the 81 keV gamma ray indicate it to be either E1 or M1. Life-time and intensity considerations tend to favor the M1 multi-polarity. On the basis of shell theory and the comparison of ft. values for the transitions between ground states of the chain  $\text{Ce}^{144}$ - $\text{Pr}^{144}$ - $\text{Nd}^{144}$ , the parity and spin of  $\text{Pr}^{144}$  are believed to be odd and 0 respectively.

In  $\text{Pr}^{144}$  the intensities of the 0.86 and 2.3 MeV beta rays were found to be 1-2% each. This falls between the 5% and <1% intensities previously reported in the literature.

Microfilm copy of complete manuscript of 100 pages, \$1.25. Enlargements 6" x 8", 10¢ per page. Library of Congress card number MicA54-539.

## PHYSIOLOGY

### ELECTROLYTE MOVEMENT IN RABBIT POLYMORPHONUCLEAR LEUKOCYTES

(Publication No. 6811)

Harold George Hempling, Ph.D.  
Princeton University, 1953

Studies were carried out on the electrolyte metabolism of rabbit polymorphonuclear leukocytes obtained by intraperitoneal injection.

Potassium content was found to be 105.1 6.1 meq/kg cell water, sodium 67.5 11.1 meq/kg cell water, and the water content 79.0 1.14 per cent. Simple cytolysis of the cells in distilled water removed all analyzable K and Na, and ashing was found to be unnecessary.

Mechanical agitation of leukocyte suspensions produced an enhanced rate of potassium loss with a reciprocal gain in sodium.

Cells in exudate fluid with an average K concentration of 2.0 meq/liter were found to lose K gradually over a 24 hour period, replacing it with a reciprocal amount of Na. Usually 50% of the cell K was lost during this time period. The addition of glucose was found to slow the rate of K loss, regardless if the glucose were added initially or at intermittent intervals. Acid conditions in the pH range of 6.4 to 6.7 were found to accelerate K loss, when compared to normal exudate values of 7.4. The extent of K loss after 24 hours was the same under aerobic and anaerobic conditions. Maintaining cell suspensions at 20°C. produced a loss of K described by the equation of a first order reaction. Per cent of cell K lost per hour was 1.07. An exact reciprocal amount of Na was gained.

Studies on glucose utilization and hydrogen ion production were carried out in conjunction with electrolyte analyses. Protection against K loss by glucose could not be attributed to simple hydrogen ion exchange for extracellular K. Changes in the K-Na pattern in relation to the static and dynamic properties of the leukocyte membrane were discussed.

Microfilm copy of complete manuscript of 92 pages, \$1.15. Enlargements 6" x 8", 10¢ per page. Library of Congress card number MicA54-540.

### ELECTRICAL ACTIVITY IN THE UTERUS OF THE RAT

(Publication No. 6968)

Carlton Earl Melton, Jr., Ph.D.  
University of Illinois, 1953

The spontaneous electrical and mechanical activity and electrical responses to shocks in the uteri of 82 sexually mature castrate rats and one pregnant

rat were studied. The castrate uterus shows spontaneous electrical and mechanical activity for about two weeks following castration. Graded doses of either diethylstilbestrol or estradiolcyclopentyl propionate gradually restore the inexcitable castrate uterus of more than two weeks standing to a high level of excitability.

The spontaneous electrical activity in the uterus of the estrogen-primed castrate rat is of two types, a low broad wave of less than 1 millivolt not usually associated with contraction and a burst of high sharp spikes of 1 - 2 millivolts associated with total contraction. The low deflection is independent in different portions of the uterus and the high spikes are propagated throughout the whole uterus. Concurrently with contraction, the burst of high spikes is often seen to be superimposed on a slow deflection of the electrical base line. This d. c. shift is thought to be a fusion of spikes. Spontaneous activity may be initiated at any point on the uterus and spread in all directions.

The estrogen-primed uterus responds to a shock with an action potential which may either be local or be propagated throughout the whole uterus. The wave form of the action potential is variable from one preparation to another and from point to point on the same uterus. The velocity of propagation of the action potential ranges from 3.0 - 7.0 cm./sec. This inconstancy of velocity is due to a progressive shortening of the latency of response on repeated stimulation. Velocities which fall outside this range are thought to be erroneous since, in many cases, it was impossible to identify the same wave at different electrode separations. Spontaneous activity also rendered reliable measurements of velocity difficult to make. When large spontaneous bursts are taking place, shocks are ineffective.

Progesterone, 1, 5, or 10 mg., given 12 hours after the last of four daily 5  $\gamma$  priming doses of estrogen had no effect on the electrical activity of the uterus at 1, 2, 4, 8, 12, or 24 hours. Progesterone does cause fluid resorption from the lumen of the uterus and a decrease in tone of the musculature.

Spontaneous activity and responses to shocks are abolished by nicotine  $10^{-3}$ . Nicotine  $10^{-4}$  causes massive electrical discharges which are continuous, synchronous, and accompanied by tetanic contraction.

Responses to shocks are reduced but not abolished by curare  $10^{-3}$  or  $10^{-3.5}$ .

Spontaneous electrical activity is made continuous and contractions tetanic by eserine  $10^{-5}$ . Eserine  $10^{-4}$  blocks the high spikes, leaving only the low type of local electrical and mechanical activity.

Pitocin and pituitrin have no effect on the electrical activity when applied locally. Soaking in pituitrin (3 IU/cc.) causes a slow depolarization of the myometrial cells accompanied by a slow rhythmic contraction.

The pregnant uterus is quiescent; pituitrin acts



locally to produce a low regular electrical discharge and contraction.

Preliminary studies on the actomyosin and collagen-elastin content of the castrate and castrate estrogen-treated uterus show that there is an increase in actomyosin with increasing doses of estrogen up to a maximum; the amount of actomyosin declines with higher doses. Collagen-elastin decreases with increasing doses of estrogen.

The blockade of uterine activity by nicotine, eserine, and curare is not considered to be necessarily evidence for a neural system in view of the high concentrations needed for blockade. Further, no ganglionic system has been convincingly demonstrated in the uterus histologically and the velocity of conduction is too slow for through nerve fibers. For these reasons it is concluded that the observable facts are not consistent with the hypothesis of neural conduction. The variability in the form and number of components of the action potential and the fact that histological demonstration of cellular anastomoses has not been accomplished cast doubt on the hypothesis of protoplasmic continuity.

An hypothesis is presented which states that the myometrial cells are discrete units. These units are contiguous and exist in a sort of 'ephaptic' relationship to each other and could excite each other after a definite period of delay. The conduction system which becomes expressed in the uterus under the influence of estrogen could be a combination of increased excitability of the muscle cells and a decrease in the amount of connective tissue separating them. The critical experiment to test this hypothesis will be the measurement of intercellular resistance by microelectrodes. This will tell to what extent the cells are discrete. To date successful experiments with microelectrodes have not been performed on smooth muscle.

Microfilm copy of complete manuscript of 139 pages, \$1.74. Enlargements 6" x 8", 10¢ per page. Library of Congress card number MicA54-541.

#### AN EXPLORATION OF THE ROLE OF MUSCLE TEMPERATURE IN THE CONTROL OF BREATHING DURING EXERCISE

(Publication No. 7054)

Donald Pryse Morgan, Ph.D.  
Northwestern University, 1953

Although the hyperpnea that accompanies muscular work has been the object of experimental study for more than 60 years, the principal mechanism of its physiologic regulation remains undiscovered. The blood chemical factors  $p\text{CO}_2$ , pH, and  $p\text{O}_2$  have been shown to provide no more than a "fine adjustment" of respiration to the requirements of the organism for gas exchange. Of the numerous attempts to establish the operation of other physiologic mechanisms, many have been designed to test the hypothesis that stimuli originating in the working tissues operate on

the respiratory center through neural afferent pathways. Unfortunately, critical analysis has revealed that these studies serve neither to establish nor to disprove the participation of a reflex control mechanism. Nevertheless, considerable interest has centered around experiments testing the operation of various specific physical or chemical changes in exercising limbs as neurally mediated stimuli to the respiratory center. To date, none of the phenomena tested (joint motion and certain chemical changes associated with muscle metabolism) has been shown to play a part in the control of exercise hyperpnea.

In attempting to extend experiments of this design in a promising direction, certain reported observations have appeared to be significant. It is known that body (rectal) temperature rises moderately in exercise to levels linearly related to the metabolic rate, and that relatively severe general hyperthermia is a potent respiratory stimulus in resting man. Moreover, it has been shown that both ventilation and working muscle temperature increase immediately when exercise is begun, and reach steady state levels at approximately the same time. Finally, there is some evidence that the magnitude of rise in muscle temperature increases with the work intensity. The present study was therefore undertaken to determine whether or not such changes in muscle temperature operate as reflex stimuli to breathing.

To do this, the pulmonary ventilation of resting barbitalized dogs was measured continuously while the muscles of the hind limbs were heated over the approximate temperature range characteristic of severe exercise. Heating was accomplished initially by pumping warm water through radiators fashioned from copper tubing and inserted surgically between the muscles of both thighs. In subsequent experiments, the muscles of one thigh and hip were heated by a microwave diathermy machine whose output was regulated so as to induce the relatively limited temperature elevations characteristic of exercise. Heating of the skin was avoided either by continuous application of cool water, or by surgical excision prior to diathermy treatment. Deep muscle temperature was measured and recorded continuously by one or two copper-constantan thermocouples connected to a two-channel Brown recording potentiometer. The rate of pulmonary ventilation was measured and recorded spirometrically.

In a series of 29 experiments on 12 dogs, muscle temperature was elevated from an average control level of  $35.5^\circ\text{C}$ . to an average level of  $40.2^\circ\text{C}$ . This increase of  $4.7^\circ\text{C}$ ., even though greater than that occurring in severe exercise, was not accompanied by any significant change in rate of pulmonary ventilation. The experiments, then, served to discount the hypothesis that increased muscle temperature constitutes a reflexly mediated stimulus in the control of exercise hyperpnea. Efforts to corroborate this conclusion through alternative experimental designs and techniques yielded information of less definitive value than that provided by the investigation described above.

Microfilm copy of complete manuscript of 112 pages, \$1.40. Enlargements 6" x 8", 10¢ per page. Library of Congress card number MicA54-542.

**EFFECTS OF BEEF HYPOTHALAMIC  
EXTRACTS ON WATER AND FOOD INTAKE,  
URINE OUTPUT, AND BLOOD SUGAR LEVELS  
IN RATS**

(Publication No. 6994)

Morton Benjamin Waitzman, Ph.D.  
University of Illinois, 1953

This study was undertaken to help elucidate the effects of neurosecretory substances found in certain nuclei of the hypothalamus on the regulation of water intake, urine output, food intake, and blood sugar levels. A review of the literature had indicated that these neurosecretory substances might be of importance in the regulation of these phenomena.

Aqueous, lipid, and emulsified extracts were prepared from those areas of the hypothalamus of cattle

which include the nuclei supraopticus and paraventricularis. Three injection levels of each of these fractions were used - 10, 100, and 1,000 milliunits per hundred grams of rat body weight. The effects of the injection of these extracts on water intake, urine output, food intake, and blood sugar levels in rats were measured. These results were compared with the results obtained from the injection of aqueous, lipid, and emulsified cerebral cortical extracts (the positive controls) and with the results obtained during a period when no injections were given (the negative controls).

The findings of these experiments indicated that the hypothalamic extract treated animals, when compared with the control animals, showed significant reductions in water intake, urine output, and food intake and significant increases in blood sugar levels. Variations in response to the three dosage levels of the aqueous, lipid, and emulsified extracts were observed.

Microfilm copy of complete manuscript of 133 pages, \$1.66. Enlargements 6" x 8", 10¢ per page. Library of Congress card number MicA54-543.

POLITICAL SCIENCE

POLITICAL SCIENCE, GENERAL

**PARTY DEVELOPMENTS IN TURKEY,  
1945-1950**

(Publication No. 7077)

Suna Kili Derya, Ph.D.  
Bryn Mawr College, 1953

From 1923 to 1945, Turkey had a one-party system. After 1945 a two-party system was established. In order to fully comprehend the reasons for the success of party developments in Turkey since 1945, an analysis of the Ottoman Empire and the Republic of Turkey was made.

The analysis of the Ottoman Empire led to the conclusion that the factors of geography, minorities, religion, and governmental institutions had been responsible for impeding the democratization of Turkish society.

Desire to reform the Ottoman Empire started at the end of the eighteenth century. The influence of Europe was felt first in technical fields and later in other fields such as government and literature. The result was the short-lived constitutionalism of 1876.

In the second half of the nineteenth century, the Young Turk movement was established. The Young Turks were a group of men, who demanded the general reform of the Empire. Their demands led to the second proclamation of constitutionalism in 1908. After this date, several political parties were established. Attempts at the establishment of a two-party

system were not successful because of the life and death struggle between the Union and Progress Party and the Liberal Entente Party.

Following the defeat of the Ottoman Empire in World War I, a movement for national struggle started in Anatolia, which ended in 1922 with the victory of the Turks. In 1923 the Republic was proclaimed.

Between the years of 1923-1938, Turkish society went through an intensive period of reform under the leadership of Atatürk. These reforms prepared the bases for the establishment of democracy in Turkey.

Two attempts to establish a two-party system failed. Thus the Republican People's Party, founded in 1923, remained the only party until 1945.

The growing dissatisfaction with the one-party system resulted in the establishment of numerous parties between the years of 1945-1950, but the Democratic Party, founded in 1946, remained the major opposition party.

The Election Law of 1946 enabled the Turks for the first time to vote for their deputies directly, which they did in the July 21, 1946, general election. The Democrats charged that fraud and force were employed in this general election.

The Democratic opposition as well as the moderate members of the majority party desired to amend certain laws which they believed infringed on the rights of the individual. Accordingly several laws as the press law, the police law, and the election law were amended.

In 1948 the Nation Party was founded. This



party became the third important party in Turkey, and it opposed both the Republican People's Party and the Democratic Party.

The Democratic Party refused to participate in any election until the election law was amended to provide for judicial guaranty of the election procedure, and this demand was provided by the Election Law of 1950. The May 14, 1950, election took place under this election law. In this election the Democrats defeated the Republican People's Party, and for the first time in the history of the Republic, the majority party became the minority party.

The following were the most important reasons for the success of party developments between the years of 1945-1950: Turkey did not have an Empire, but her own land to defend, and she had a remarkably homogeneous population. The reforms of Atatürk had prepared a firm basis for the reception and development of democratic institutions. Increasing contact with Western Europe and its political systems was also among the factors responsible for the success of party developments. The quality of leadership, increasing political consciousness of the people, and discrediting of extremism also accounted for the success of party developments since 1945.

Because of the party developments since 1945, the progress of Turkish democracy has been remarkable.

Microfilm copy of complete manuscript of 389 pages, \$4.86. Enlargements 6" x 8", 10¢ per page. Library of Congress card number MicA54-544.

#### EXTRATERRITORIAL POWERS OF MUNICIPALITIES IN THE UNITED STATES

(Publication No. 6964)

Russell Webber Maddox, Jr., Ph.D.  
University of Illinois, 1953

A study of the extraterritorial powers of municipalities in the United States must be based largely on three sources, namely, constitutional and statutory material, court decisions, and reports from local officers as to actual practice in use of such powers. A review of the statutory grants of authority provides a view as to the types of powers which municipalities are authorized to exercise beyond their limits and indicates the frequency with which they are granted various extraterritorial powers. An examination of the decisions of the courts indicates the way in which the courts have interpreted these grants of extraterritorial powers - whether a strict or liberal construction has been followed. Information from local officials is especially useful in an attempt to gain some insight into the frequency with which municipalities exercise powers beyond their boundaries. A statutory grant is significant only if used.

An examination of the early history of English cities reveals that specific boundaries were not considered significant. It was common for cities to possess certain "liberties" which extended for various

distances from the central area. By the time of the founding of this country, a specified area had become characteristic of English municipalities, and it has always been considered essential to a *de jure* municipality in the United States. Furthermore, it has been generally accepted that municipal powers are to be exercised only within municipal boundaries in the absence of specific statutory authority to the contrary.

As increased demands have been made for municipal services, it has become apparent that cities could not meet these demands adequately and at the same time exercise powers only within their corporate area. The major areas in which this need of extraterritorial power has become apparent are water supply, sewage disposal, utilities, airports, parks, police and fire, and subdivision control.

State legislatures have generally authorized municipalities to go beyond their limits in order to assure their residents an adequate water supply, and also sufficient facilities for the disposal of sewage. Cities have made widespread use of this authority. Frequently, cities are authorized to sell water and to provide sewage disposal facilities for persons outside their limits. This power is often subject to numerous qualifications. A number of states authorize cities to furnish electricity or gas to their residents from extraterritorial municipal plants or sell the products of municipal plants to customers beyond their limits. Cities construct and maintain various types of projects beyond their boundaries, such as bridges and ferries, public welfare or penal institutions, markets, recreational facilities, parks, and airports.

Although the general rule is that municipalities may exercise police power only within their corporate area, most states grant municipalities authority to exercise some phase of police power beyond their limits, especially for the protection of the health, welfare, and morals of their residents. Local police officers are granted extraterritorial jurisdiction in several states in order that they may more effectively enforce state laws and local ordinances.

Without specific legislative authority, municipalities may not extend their powers to tax or license beyond their limits. Power granted to municipalities to exercise their licensing authority extraterritorially is generally designed for purposes of regulation and not revenue.

The development of suburbs outside their boundaries has posed serious problems for municipalities. Many states have extended the jurisdiction of municipalities for limited purposes beyond their limits in order that they may cope with this problem. These laws have often proved inadequate, and some states have provided for a co-operative arrangement between municipal and county authorities for the regulation of extraterritorial subdivisions.

Microfilm copy of complete manuscript of 223 pages, \$2.79. Enlargements 6" x 8", 10¢ per page. Library of Congress card number MicA54-545.

**RICHARD COBDEN AND CORDELL HULL:  
A COMPARATIVE STUDY OF THE COMMERCIAL  
POLICIES OF NINETEENTH CENTURY ENGLAND  
AND CONTEMPORARY UNITED STATES**

(Publication No. 6828)

Jaen Pennar, Ph.D.  
Princeton University, 1953

Nineteenth century England and contemporary United States present many parallels in the development of international trade and commerce. In both countries a traditionally entrenched commercial policy, based on tariff protectionism, was reversed to conform with the ideals of free trade liberalism. This dissertation has attempted to indicate to what extent and in which respect the commercial policies of Victorian England and contemporary United States show parallels, or dissimilarities, in their development and application.

The following points are listed to show the parallels between the two countries. (1) A similar economic background – capitalistic nations depending upon foreign trade for the maintenance and further expansion of their prosperity. (2) A similar political background – democratic nations depending upon parliamentary means for any change in tariffs and commercial policy. (3) A similar historical background – both countries were traditionally protectionist prior to commercial reform. (4) A similar ideological background – commercial reform in the two countries embraced, and expanded upon, the principles of free trade supplied by the school of Classical Economics. (5) A similar international background – commercial reform was pursued in the face of widespread foreign opposition to the principles of liberal commercial policy. (6) A similar process of change in commercial policy. The traditionally entrenched policy was reversed to conform with the principles of free(r) trade: (a) during a period of national crises – the Irish Potato Famine in England and the Depression in the United States; (b) by a small group that converted national leadership to its way of thinking – the Manchester School in England and a group in the New Deal administration that subscribed to the philosophy of Cordell Hull in international commerce.

The differences in commercial policies between the two countries for the periods under study are listed as follows. (1) The continental character of the United States has contributed towards a different economic structure in this country. Among its many results is the enormous size, as opposed to Victorian England, of the American home market. The U. S. has therefore shown less concern for foreign trade than Great Britain. (2) The political structure of American society has developed in a manner that, barring a national emergency, permits sectional occupational groups to wield powerful influence over national legislation. The tariff has traditionally been associated with the parcelling out of governmental benefits to various interest groups. The Reciprocal Trade Agreements Program has had to conform with those pressures. (3) Commercial reform

in the United States did not take the form of a popular movement as exemplified in Victorian England. (4) The differences between Victorian England and contemporary United States stand out most clearly in the results achieved. Although American tariffs have been lowered and the trend has been away from a protectionist commercial policy, the U. S. has barely begun to tread the path that England followed in 1846. (5) The United States adopted a "reciprocal" commercial policy, i.e. any reductions in the duties and other trade restrictions are dependent upon the reciprocal reduction by other nations of the same. England's course, however, was unilateral.

In thought and procedure, therefore, it is maintained that the two countries show more similarities than differences in commercial policies. However, from the point of view of the results achieved the differences come to the fore. The Reciprocal Trade Agreements Program, on the other hand, has not run its full course as yet.

The prospects for a freer American trade policy depend upon: (a) the need for, and the supply of, raw materials in this country; (b) the attempts at political integration of the Western World and the share of international trade in accomplishing this goal; (c) the relative strength of the pressure groups advocating either freer trade or more protectionism; and (d) the reaction of the Republican Administration and Congress to the points listed above. Should the program outlined by President Eisenhower in his State of the Union Message, calling for a more liberal approach to American commercial policy, find acceptance in Congress this policy might show even greater parallels with the free trade era of Victorian England than are now apparent.

Microfilm copy of complete manuscript of 331 pages, \$4.13. Enlargements 6" x 8", 10¢ per page. Library of Congress card number MicA54-546.

**THE LABOR GOVERNMENT AND  
BRITISH INDUSTRY, 1945-1951**

(Publication No. 6832)

Arnold Austin Rogow, Ph.D.  
Princeton University, 1953

The study was conceived as an attempt to explore the significance of the most recent British revolution, the achievement of the Labor Government between 1945-1951. It was believed that research on the relations between the Labor Government and the private industrial sector would reveal the essence of the achievement, and, at the same time, illuminate the character of British socialism. It was also thought that such a study might produce some insights into the problem of reform and social control in a democratic society.

The first two chapters deal with the theoretical approach of the Labor Party in 1945, and with the general organization of planning and controls under the Labor Government. Special attention is paid to



the objectives and machinery of planning, and to the operation of the most important financial and physical controls.

Chapter Three is concerned with the structure of British industry and the Labor Government's anti-monopoly policy. It begins with an examination of the concentration of ownership and control in British industry, and the rise of trade associations. The remainder of the chapter is largely devoted to an analysis of the Monopolies and Restrictive Practices (Inquiry and Control) Act of 1948, and to the achievements of the Monopolies and Restrictive Practices Commission which was established under the Act. It is concluded that the Labor Government was never really certain whether it was for or against monopoly, and the general approach is criticized as being slow, cumbersome, and relatively ineffective.

Chapter Four is devoted to formal and informal relations between the Labor Government and industry. The use of 'sponsoring' or production departments, advisory committees, and Development Councils is examined in some detail. The point is made that the tendency of the controls and the choice of controllers was to strengthen industrial concentration and self-government. The case for using businessmen and business organizations as controllers is set forth and partly accepted, but it is noted that the Labor Party is hardly aware of some of the effects of such control, or the need to broaden the social recruitment of industrial managers.

Chapter Five treats the relations between government, industry and labor. Methods of wage-fixing, conciliation and arbitration are briefly examined. It is argued that the initiative in the creation of a new industrial harmony was largely left to business, and some implications for the future of the Labor Party of industry's emphasis on the 'human factor,' joint consultation and profit-sharing are suggested.

Chapters Six and Seven deal with some general aspects of the Labor Government's program and its effect upon industry. Chapter Six on taxation and income distribution under Labor attempts to show that business taxation was less rigorous than was often assumed, and that the effective redistribution of income was not entirely egalitarian. Chapter Seven compares the public relations programs of government and industry, and concludes that business was generally more successful in putting over a point of view.

Chapter Eight examines the conflict over nationalization of the steel industry. The industry's efforts to defeat nationalization both before and after the passage of legislation are studied in some detail. It is concluded that the bitterness of the steel dispute was occasioned by an awareness on both sides that it involved a control, rather than property-rights issue with regard to a crucial industry. It is suggested that any subsequent attempt by Labor to socialize control of a major industry may result in a struggle that imperils the traditions of British democracy.

Chapter Nine, "The Politics of Stalemate?" evaluates the Labor achievement as testing three principal hypotheses: (1) that the Mixed Economy is an

alternative to capitalism or communism; (2) that planning is compatible with democracy; (3) that power groups will cooperate with change designed to reduce their powers and influence. It is noted that business and labor groups tend to develop a vested interest in the mixed economy, and that the ethic of a mixed economy is carried over from the older economic order. Labor's failure to generate a dynamic for any future transition, as one aspect of the general dilemma of gradualist, reform movements, is examined, as is Bevanism which is viewed as one response to the dilemma.

Microfilm copy of complete manuscript of 495 pages, \$6.19. Enlargements 6" x 8", 10¢ per page. Library of Congress card number MicA54-547.

#### POLITICAL SCIENCE, PUBLIC ADMINISTRATION

##### POLICY FORMATION IN THE APPROPRIATION PROCESS, WITH SPECIAL EMPHASIS ON THE HOUSE APPROPRIATIONS COMMITTEE

(Publication No. 6944)

Robert Sidney Friedman, Ph.D.  
University of Illinois, 1953

The process of appropriating funds for the operation of the executive departments of the national government has involved considerably more than maintaining "economy and efficiency" in government. Many Congressmen and some political scientists have argued that in appropriating funds Congress should restrict itself to attaining the most economic and efficient manner of conducting a specific program. They insist that because of this there should be, and in practice usually is, very little partisanship displayed in the process.

Examination of twelve agencies scattered throughout the administrative branch of government during a selected group of years beginning in 1923 and ending in 1948 indicates that it would be impossible to divorce the Congressional function of appropriation from the realm of adjustment and formulation of public policy. This was made abundantly clear in the 1946 National War Agencies Appropriation Bill in which language was included expressly liquidating the Fair Employment Practices Committee at the end of the year. However, a substantial amount of policy adjustment and formulation occurred in all the agencies studied, ranging from deletion of new projects for the Bureau of the Census to a denial of an additional assistant director for the Bureau of Engraving and Printing. In addition, a vast readjustment of public policy has occurred in most instances where simple increases or decreases are voted for particular agencies or functions. In some instances, Congress has specifically earmarked the application of the monetary change, but even when no stipulation has been

included in the language of the appropriating act, the agency has often been forced to alter its program to meet the financial change voted by Congress.

The deliberations of the Appropriations Committees have maintained a considerable non-partisanship. Nevertheless, where controversies have arisen, party cleavage has asserted itself more frequently than any other discernible group difference. This has been especially clear on roll call votes. In 22 of the 44 roll calls tabulated, at least 90 percent of the Democrats who were recorded voted in opposition to at least 90 percent of the Republicans recorded.

In a number of the agencies studied, the adherence of a number of private groups and members of Congress to a program of the agency has enhanced the ability of that program to obtain larger funds than other programs of the agency, and in some cases larger than the Budget Bureau has been willing to recommend. This was particularly emphasized in the willingness of Congress to appropriate funds for the "Coal Mine Inspection" program of the Bureau of the Mines.

One factor which cannot be ignored in studying the extent of policy formation through the appropriation of funds has been the actual procedures by which appropriations are enacted. The complexities of the process have led, in part at least, to the predominance of the Committees, and especially of the House Committee, in the process. This has meant that 50 men have been made responsible for tremendous decisions in the appropriation of funds for the entire national government. Inasmuch as the Committees have been broken down into Subcommittees which have considerable autonomy, five to seven men in each house have made most of the crucial decisions. The predominance of the Committees and their Subcommittees is felt from the start of the hearings and continues to be felt until the bills are finally enacted. This has been exemplified particularly through a number of parliamentary devices whereby amendments sponsored by Committee members have been adopted with relative ease and those lacking Committee endorsement have encountered great difficulty.

Without question, therefore, the nature of the membership of the Appropriations Committee has loomed large in determining the success or failure of many government programs.

A thorough knowledge of public policy formation in American government clearly necessitates an understanding of the procedures by which money is appropriated as well as of the actual appropriations made.

Microfilm copy of complete manuscript of 309 pages, \$3.86. Enlargements 6" x 8", 10¢ per page. Library of Congress card number MicA54-548.

## THE USE OF THE LICENSING POWER BY THE CITY OF ST. LOUIS, MISSOURI

(Publication No. 6987)

John Ernest Swanson, Ph.D.  
University of Illinois, 1953

One of the most important powers possessed by municipal corporations is the licensing power. As a corollary of the police power the license represents the major tool through which a municipality regulates private enterprise. At the same time, the licensing power may be used as a major source of revenue to finance the city's operations. Thus, it becomes important to know how the licensing power is actually being used by American municipalities. An intensive examination of the use of the licensing power by one selected American city should prove of value in evaluating the license as a regulatory and a revenue device within that particular city, and some generalizations and conclusions may be made on the basis of this experience.

In this particular study St. Louis, Missouri, was chosen for examination. The very size of St. Louis creates a number of complex problems which invite the use of regulatory licenses to a far greater extent than would be the case in a smaller municipality, and its problems may be considered as typical of large city problems in this country. St. Louis operates under a home rule charter and has so operated longer than any other city in the United States. It might be expected, then, that the city would have considerable freedom to experiment with the use of the licensing power as both a regulatory and a revenue device.

The only state restrictions on the city's licensing powers are a stipulation that any business licensed must be "specially named" in the St. Louis charter and the specification of seven occupations which may not be licensed by the city - none of which would normally be licensed. The former restriction does not apply to regulatory licenses issued under the police power. On the administrative side, licensing is centered in one central office, the Office of License Collector, where all licenses are issued and all licensing information may be obtained. In the case of regulatory licenses, most licenses are issued by the License Collector only upon the presentation of a permit from the Board of Public Service, a five man administrative board which conducts hearings on all such license applications, delegates investigation of the applicant to the city department most concerned with the license to be issued, and grants or denies the permit necessary to obtain the actual license. Revocations are likewise channeled through the Board of Public Service.

Revenue licenses provide 23.46 per cent of the total income of the city, second only to property taxes as a revenue-producer. Only one city in the United States (Philadelphia) over 500,000 population derives a greater percentage of its total income from licenses.

The experience of St. Louis with regulatory licensing would indicate that this approach to municipal



regulation of private enterprise has four distinct advantages: 1) flexibility; 2) ease of administration; 3) clarity of locus of power and responsibility; and 4) ease of access to the locus of power for both citizens and potential licensees. Balanced against this are certain disadvantages, namely, the short period for which the license is issued and the fact that the regulatory license is no better than its administration which in St. Louis has been good. For revenue purposes the St. Louis experience would certainly indicate that the possibilities of the use of the licensing power for revenue purposes have barely been tapped by many cities. If a municipality is granted the powers necessary to put it into operation, a revenue licensing system can play an important part in the city financial plan.

Microfilm copy of complete manuscript of 262 pages, \$3.28. Enlargements 6" x 8", 10¢ per page. Library of Congress card number MicA54-549.

#### POLITICAL SCIENCE, SOCIALISM, COMMUNISM, ANARCHISM

##### THE NON-COMMUNIST LEFT IN POST WAR FRANCE: AN INTERPRETIVE STUDY IN DOCTRINAL INTRANSIGENCE AND INFLEXIBILITY AS EXEMPLIFIED BY THE SOCIALIST PARTY AND NON-COMMUNIST SYNDICALISM

(Publication No. 6809)

Edwin Drexel Godfrey, Jr., Ph.D.  
Princeton University, 1952

In this study the vitality of the two principal organizations of the non-communist Left in France, (the Socialist Party and that section of the syndicalist movement rejecting communist leadership), is examined at a point of low pressure – the post-World War II period. The thesis does not attempt to describe the competition offered these groups by their communist counterparts, nor to analyze at length the enervating effects on them of being squeezed in the political middle between two large forces on the extremes, i.e., the Communists and the traditional Right of DeGaulle and "Big Business."

Emphasis is placed on the inherent weaknesses, incapacities, and tactical blunders of the two movements, with special attention paid to their lack of manoeuvrability occasioned by an insistent preoccupation with nineteenth century revolutionary

doctrine. It is here suggested that the Socialists and the "Force Ouvrière" labor group had in practice long since abandoned the more cataclysmic implications of their philosophies, but that the reluctance of their leadership to seek new strategical patterns outside of rigid Marxist and syndicalist moulds – and perhaps thereby create a new identity for themselves as democrats of the Left – has contributed to their impotence.

Evidence is presented to support the proposition that à propos at least one intransigently maintained shibboleth of the traditional Left, proletarian solidarity, it was largely the rank and file, in day-to-day, living contact with the Communists, which raised the first doubts, ultimately resulting in the smashing of the principle.

Two brief introductory sections in the study deal with the doctrinal background of socialism and syndicalism prior to World War II. Here the recurrent divisions on the Left are discussed in an effort to demonstrate that distinctions based on opposing conceptions of human dignity were bridged for only short, uneasy periods of unity. Jauresian humanitarianism and a moderate job-control philosophy are shown to have made their imprints on the two movements, despite retention of the symbols and syllables of revolutionary dogma, shared by the Communists.

The heart of the thesis, drawn from transcripts of congresses, conferences, and official publications of the Socialists and the "Force Ouvrière" wing of syndicalism, is a dissection of the efforts of rank and file militants in both organizations to modify the direction of their leadership. Harmony with the Communists (at least in public declarations of faith) is regarded by many of the leaders as a recognition of doctrinal imperative – the rank and file, however, often looks on it as a sacrifice of organizational identity. The complications of another philosophical sacred cow, the apolitical nature of syndicalism, are discussed as they relate to the overall picture of inflexibility on the non-communist Left. After 1947, when all pretense at co-operation on the Left is finally ended, the inflexibility remains, as far as "Force Ouvrière" is concerned, diminishing further the ineffectiveness of non-communist labor.

Finally, in conclusion, it is suggested that the efforts of some within both organizations to break away from the stranglehold of outdated creed, was actually in keeping with the changing nature of the labor force in France, in the process of losing its mass, proletarian characteristics.

Microfilm copy of complete manuscript of 346 pages, \$4.33. Enlargements 6" x 8", 10¢ per page. Library of Congress card number MicA54-550.

## PSYCHOLOGY

### PSYCHOLOGY, GENERAL

#### DIANETIC THERAPY: AN EXPERIMENTAL EVALUATION: A STATISTICAL ANALYSIS OF THE EFFECT OF DIANETIC THERAPY AS MEASURED BY GROUP TESTS OF INTELLIGENCE, MATHEMATICS AND PERSONALITY

(Publication No. 7095)

Harvey Jay Fischer, Ph.D.  
New York University, 1953

An experiment was devised to afford an objective and definitive test of the claims for dianetic therapy. Provision was made for obtaining adequate information without anticipating the direction of the effects of dianetic therapy. Dianetic proponents specifically claim effectiveness in only three areas: intellectual functioning, mathematical ability, and personality conflicts. These areas were measured by tests selected because they were standardized instruments shown to be both reliable and valid. For mathematical ability and intellectual functioning, multiple tests were used in an effort to provide a representative score. Three equated groups of subjects, totalling 36 persons, were selected. The three groups were exposed to different amounts of dianetic therapy during an interval of 60 days, the first having no hours, the second 18 hours, and the third 36 hours. Eighteen hours of dianetic therapy are claimed to afford a significant change in the subjects in the three areas. The design utilized the controls of educational status and age with the influence of sex partialled out. The tests were administered to all subjects both before and after the therapeutic interval. For the second testing session, alternate forms of the tests were used. Difference scores were calculated for each subject in each of the areas measured and these were subjected to statistical analysis. The method of multiple factor analysis of variance was used.

For the population of disturbed persons who applied for dianetic therapy, and who were between the ages of 22 and 47 years, and who had had at least some high school education, regardless of the sex of these persons, it was concluded that: (1) dianetic therapy does not exert a systematic influence either favorably or adversely upon intellectual functioning; (2) dianetic therapy does not exert a systematic influence either favorably or adversely upon mathematical ability; and (3) dianetic therapy does not exert a systematic influence either favorably or adversely upon the degree of personality conflicts.

Microfilm copy of complete manuscript of 59 pages, \$1.00. Enlargements 6" x 8", 10¢ per page. Library of Congress card number MicA54-551.

#### INTOLERANCE OF AMBIGUITY IN THE INTERPERSONAL AND PERCEPTUAL-COGNITIVE ASPECTS OF PERSONALITY

(Publication No. 6903)

Barclay Cluck Martin, Ph.D.  
Stanford University, 1953

This research was designed to test the hypothesis that intolerance of ambiguity was a general personality trait which would manifest itself in both the interpersonal and the perceptual-cognitive areas of behavior. Three specific predictions were made; namely, that measures of intolerance of ambiguity in an interpersonal situation would be correlated with measures obtained on (1) a Figure Preference test, (2) a Letter Recall test and (3) the aniseikonic illusion. The subjects used were sixty-eight male college students.

Direct measures of a person's ability to tolerate ambiguity in an interpersonal situation were obtained. This was done by confronting the subject with an ambiguous task and giving him ambiguous instructions. The number of questions that the subject asked before he was willing to impose his own structure upon the situation and proceed accordingly was expected to constitute a measure of his need to reduce ambiguity. An attempt was made to standardize the role of the experimenter so that each subject would face equivalent situations. Three different ambiguous situations based on the above experimental model were employed.

The Figure Preference test consisted of forty black and white line drawings on three and one-half by five inch cards. Sixteen of these drawings tended to be simple and symmetrical in form. The remaining twenty-four were complex-asymmetrical in form. The subjects were asked to indicate their preferences - liked and disliked - for these forty drawings. It was predicted that subjects who were intolerant of ambiguity in the interpersonal situations would like the simple-symmetrical drawings and dislike the complex-asymmetrical drawings. The results did not support this hypothesis.

In the Letter Recall test letters in various patterns were presented tachistoscopically on a screen for about one-half second. The subjects were then asked to write down in a row all the letters that they could remember. There were eighteen sets of letters altogether: seven sets were in a circular pattern; another seven sets were in a spoke-wheel pattern; and four sets were of a random pattern. Two scores were obtained: (1) a Pattern Consistency score which measured the degree to which a subject consistently followed the same pattern or organization from one set to the next in writing down the letters; (2) a Substitution Error score which measured



the subject's tendency to guess at letters when he was in doubt about them. It was expected that subjects who were intolerant of ambiguity in the interpersonal situations would make high scores on Pattern Consistency and low scores on Substitution Errors. This hypothesis was not supported by the results.

The Aniseikonic measures were obtained by presenting the subject with an unstable visual field induced by the wearing of aniseikonic lenses. After the subject had had the lenses on for awhile he usually saw the illusion of a card table, the standard stimulus used in this experiment, tilt or slant toward him. Two scores were obtained in this situation, the average time before the subject reported seeing the illusion and the estimated tilt of the card table in inches. It was predicted that subjects who took a long time to see the illusion and who saw it with small magnitude would be intolerant of ambiguity in an interpersonal situation. The results supported this hypothesis. The total number of questions asked in the interpersonal situations correlated .429 with the common logarithm of the average time to see the illusion, and correlated -.250 ( $p$  equal to .05) with the estimated tilt of the illusion.

It was concluded from these results that the trait of intolerance of ambiguity is not as general a personality characteristic as was initially proposed. However, the correlations between the interpersonal measures and the Aniseikonic measures were thought to be evidence for some generality of the tendency to maintain a well structured, unambiguous and predictable environment.

Microfilm copy of complete manuscript of 113 pages, \$1.41. Enlargements 6" x 8", 10¢ per page. Library of Congress card number MicA54-552.

# AN INVESTIGATION OF THE RELATIONSHIP BETWEEN ASPIRATIONS, EXPECTATIONS, AND SOCIOECONOMIC BACKGROUND OF MALE HIGH SCHOOL JUNIORS AND SENIORS

(Publication No. 7115)

Jerome Martin Seidman, Ph.D.  
New York University, 1953

## Problem

This investigation was undertaken to study the relationships between the humanitarian values of adolescents, their occupational aspirations and expectations, and their socioeconomic background.

## Method

### Instruments

**Questionnaire.** Humanitarianism was assessed by two questions, on avocational and personality choice: "When you are making a living for yourself, how would you like to spend your spare time, including week-ends but not vacations?" "When you finish your schooling, what sort of a person would you like to be?" The responses to the

avocational question were classified into ordinary, creative, and community service activities. The responses to the personality question were classified thus: material values, good personality, friendliness, kindness, cooperativeness, self-sacrificing. Occupational aspirations were assessed by "When you are old enough to earn your own living, what kind of work do you think you will most likely do?" The responses were classified, professional and managerial, clerical and skilled, and semi-skilled and unskilled. The remaining three questions dealt with the expectations regarding these three questions.

**Socioeconomic Background Form.** This instrument consisted of three items: occupation of father, father's major source of income, education of parents. Socioeconomic background was derived from a rating on a seven point scale and a weighted score on each of the three items, the total score being categorized: "upper," "middle," and "lower."

## Subjects

The subjects of this study were the 611 eleventh and twelfth grade boys in the seven high schools located in six New England communities.

## Procedure

Each of the subjects answered the questionnaire and filled out the socioeconomic background form. To assess the repeat reliability of the questionnaire and the consistency of the adolescents' responses, after six weeks one school group of fifty-four boys answered the questionnaire again and seven judges matched their first and second responses. To assess the validity of the questionnaire responses, the same questions were used in recorded interviews with a sample of eighteen students and three judges matched the written and verbal responses. To assess the reliability of the questionnaire classification schema two judges classified twice, and one judge once, the answers of one hundred and one adolescents, a twenty percent sample. To assess the validity of the socioeconomic background classification, in one community seven persons classified a sample of forty-five families.

## Treatment of the data

The chi-square test of significance appeared to be the statistical method best suited for testing the various hypotheses including the hypothesis that the adolescents were drawn from homogenous populations.

## Results

Methodologically, it was found that the open-ended questions were technically feasible, the questionnaire items had high coding and repeat reliability, and the questionnaire and socioeconomic background rating scale had high validity.

The major conclusions drawn from this study, and applicable now only to the subjects of this investigation, were as follows:

1. Humanitarian values play relatively minor roles in adolescents' value systems.
2. The humanitarian values and expectations of adolescents are not significantly related to their socioeconomic backgrounds.

3. The occupational aspirations and expectations of adolescents are significantly related to their socioeconomic backgrounds.

4. Adolescents expect that their avocational activities and personality characteristics will be similar to their aspirations.

5. Adolescents from different socioeconomic backgrounds show similarity in the relationship between their occupational and humanitarian aspirations and their occupational and humanitarian expectations.

6. Fewer adolescents aspiring toward the professional and managerial occupations expect to enter these occupations; more adolescents aspiring toward the semi-skilled and unskilled occupations expect to enter these occupations.

7. The occupational aspirations and expectations of adolescents from correspondingly, "upper" to "middle" to "lower" socioeconomic background, increasingly tend to be "higher" than their father's occupations. Their expectations, however, are more similar to their father's occupations than are their aspirations.

Microfilm copy of complete manuscript of 125 pages, \$1.56. Enlargements 6" x 8", 10¢ per page. Library of Congress card number MicA54-553.

#### CLASS DIFFERENCES IN PREJUDICE

(Publication No. 7122)

Earl Robert Zack, Ph.D.  
New York University, 1953

Differential studies employing rigidly delimited socioeconomic status as an exploratory variable are conspicuously absent in the literature of prejudice. Recent scientific data which point up the significant differences between patterns of socialization in the middle and lower socioeconomic classes suggest the necessity for testing the prejudices of both these classes to discover the comparative extent to which they are allied to deep-lying and important needs of the personality.

This investigation was undertaken to compare the extent to which middle and lower class prejudices are allied to the personality needs of the authoritarian syndrome, and thus to aid in the problems of diagnosis and therapy with prejudiced persons.

Two samples from the middle and lower socioeconomic classes were selected on the basis of both subjective and objective criteria. The middle class sample consisted of 164 subjects of whom 144 filled out questionnaires and 20 were interviewed. The lower class sample also consisted of 144 questionnaire respondents and 20 interviewees. The subjects were between 20 and 30 years of age, were working, living or attending school in New York City, had from 1 to 4 years of high school education, were working in or preparing themselves for middle or lower class occupations, identified themselves and their neighbors as belonging to the middle or lower

class, and were children of parents who had been members of the middle or lower class, in terms of occupations they had held, over a period of years. The psychological instruments used in this research were the Frenkel-Brunswik Fascism (F) and Ethnocentrism (E) Scales, and interview. Additional objective and subjective data were ascertained for each respondent through a personal data sheet.

Three general conclusions stand out. First, the middle class sample scored uniformly higher on an item by item basis, than did the lower class, on the measure of authoritarian needs. Secondly, there appears to be a significant correlation between prejudice and authoritarian needs for the middle class sample and an insignificant one for the lower class group. The middle class coefficient of correlation between E and F Scales was .604, a value which, tested against the Null Hypothesis, was found to be significant at the five per cent level. The lower class  $r$  was .069, a value non-significant at the five per cent level of confidence. Thirdly, the middle class scored uniformly higher on selected authoritarian items stemming directly from the theoretical construct guiding this investigation.

Microfilm copy of complete manuscript of 244 pages, \$3.05. Enlargements 6" x 8", 10¢ per page. Library of Congress card number MicA54-554.

#### PSYCHOLOGY, CLINICAL

##### AN INVESTIGATION OF DIFFERENTIAL DECREMENT IN THE INTELLIGENCE OF SCHIZOPHRENICS

(Publication No. 6889)

Arnold Binder, Ph.D.  
Stanford University, 1953

The purpose of this investigation was to test the hypothesis that schizophrenia leads to a differential decrement in intellectual abilities. On the basis of the results of previous investigations this hypothesis was stated in the more specific form that schizophrenia leads to a greater impairment in the intellectual abilities associated with abstraction and generalization than it does in the abilities associated with the routine and familiar use of culturally established material.

A survey of previous studies of the concept of differential decrement in schizophrenia noted many inadequacies from both theoretical and practical viewpoints. After an evaluation of these inadequacies and their implications it was concluded that the hypothesis of differential decrement had not been crucially tested.

The present investigation attempted to overcome these various inadequacies. The Science Research Associates Tests of Primary Mental Abilities were selected as the instruments of this investigation



because they measured the relatively independent abilities postulated in a group factor theory of intelligence. The SRA battery is composed of five tests which measure the abilities of Verbal-meaning (V), Number (N), Word-fluency (W), Space (S), and Reasoning (R). On the basis of the definitions of the abilities presented by the developers of the tests, it was concluded that the abilities measured by the Space (S) and Reasoning (R) tests involved abstraction and generalization, while the abilities measured by the other tests involved only the routine and familiar use of culturally established material.

A total of 120 schizophrenics and 107 controls were selected on the basis of their being male, non-Negro, native born American, and without language difficulty. Both experimentals and controls were patients who were required to remain hospitalized at the time of testing, the latter for general medical difficulties.

The 65 schizophrenics in the sample who were at or above the age of 40 at the time of testing were compared with the 48 normals in the sample who were at or above the age of 40, and the 55 schizophrenics and 59 normals at or below the age of 39 were similarly compared. There was no significant difference between the schizophrenics and controls in mean and standard deviation of years of age or mean and standard deviation of years of education. The analysis of covariance was used to test the specific hypothesis of differential decrement. This technique made it possible to test for statistical significance the differences between the experimentals and controls on S and R which exceeded the differences accountable and predictable on the basis of the variation between the two groups on V, N, and W.

The results of this investigation do not support the hypothesis of differential decrement in schizophrenia. The specific results of the various phases of investigation may be summarized as follows: a) The differences between schizophrenics and normals on S and R were insignificant when the groups were equated on their performances on V, N, and W; b) In terms of over-all intellectual functioning, the schizophrenics showed considerable impairment; c) There were significant differences between older normals and younger normals on S and R even after they were made comparable on V, N, and W; d) There were no significant differences between older schizophrenics and younger schizophrenics on S and R when they were made comparable on V, N, and W.

These results were discussed and the hypothesis advanced that a general factor indicated by such terms as "degree of unresponsiveness to social stimuli" and "amount of decrease in social motivation" best explained the schizophrenic test performance. The relatively great heterogeneity of the schizophrenics and the large difference between normals and schizophrenics on this variable seemed to make any differential effects of schizophrenia upon the various intellectual functions operationally insignificant.

Microfilm copy of complete manuscript of 104 pages, \$1.30. Enlargements 6" x 8", 10¢ per page. Library of Congress card number MicA54-555.

# THE ALPHA INDEX IN THE ELECTROENCEPHALOGRAM AND MOVEMENT RESPONSES ON THE RORSCHACH AND PMS TESTS

(Publication No. 7018)

Charles S. Brudo, Ph.D.  
Northwestern University, 1953

This dissertation was an attempt to investigate the relationship between individual differences in electroencephalographic (EEG) and psychological variables. The suggestion found in the experimental literature to the effect that kinesthesia and the EEG occipital alpha index are positively related, and the general claim by Rorschach test experts that human or human-like movement responses (M) on the Rorschach involve kinesthetic components, led to the hypothesis that the occipital alpha index and M are positively related. In addition to testing this hypothesis the other purposes of this investigation were (a) to study the relationships existing between the occipital alpha index, M, and the movement responses on the Rorschach other than M; and (b) to analyze the relationships present between the occipital alpha index, M, and responses similar to M in content but derived from a test other than the Rorschach, i.e., the Projective Movement Sequences (PMS) test.

Thirty "normal" Ss, 15 to 17 yrs. old, were employed. Each had an EEG taken while he was awake, with eyes closed, and resting on a bed in a dimly illuminated, relatively quiet room. The Rorschach and PMS tests were administered to each S according to standard techniques. Rank order correlations were used to analyze the results.

A correlation coefficient of .37, statistically significant at the 5% level, was obtained between M and the occipital alpha index. A correlation of -.34, also significant at the 5% level, was found to prevail between this index and animal movement (FM) responses on the Rorschach. Statistically insignificant correlations were found between the alpha index and the human or human-like movement responses on the PMS, and between the latter and M.

The results concerning M, FM, and the occipital alpha index were discussed in terms of relevant psychological and physiological data, and a speculation was offered about the relationship of FM to the occipital alpha index. The results pertaining to the human or human-like movement responses on the PMS were evaluated in terms of differences between the Rorschach and PMS tests.

Microfilm copy of complete manuscript of 45 pages, \$1.00. Enlargements 6" x 8", 10¢ per page. Library of Congress card number MicA54-556.

# CULTURAL DIFFERENCES IN PERSONALITY STRUCTURE AS EXPRESSED IN DRAWINGS OF THE HUMAN FIGURE

(Publication No. 7092)

Alene J. Davidson, Ph.D.  
New York University, 1953

This was an investigation to determine whether culturally disparate groups of children demonstrate differences in personality development which might be related to variations in cultural background. This was attempted through a study of human figure drawings on the assumptions that the spontaneous drawing of a human figure reflects the individual's personality structure; that cultural differences are reflected in the personality structure of members of a cultural group; and that group differences occur in drawings of children with varying cultural backgrounds.

Selection of subjects was made from groups of Negro and white children, native to the island of St. Thomas, whose family organization, value systems and behavioral standards offered contrast to New York City groups. Fifty children were selected from each group. These included equal numbers of boys and girls in each of the five age levels of six through ten years. To serve as a basis for comparison with the Virgin Island groups, a group of New York white and a group of New York Negro children were selected from the public schools of New York City. The age and sex composition of these groups were the same as those of the Virgin Island children.

Two human figure drawings were secured from each of these two hundred children. After all the drawings were obtained, three judges, all clinical psychologists, completed a check list of the characteristics found to occur in each of the drawings. From this list, comprising one hundred and twenty-five drawings traits, a total of twenty-three significant differences between the groups in the frequency of occurrence of various drawing characteristics were found. Some hypothetical postulations were attempted as to the personality traits implied by the drawing characteristics found to distinguish each group although it was recognized that these interpretations were of limited validity. Fairly consistent indications of the slower rate of development of the Virgin Island children were present.

As a further test of the existence of real differences between the groups, three judges grouped the unidentified drawings in terms of apparent similarity and difference. A significantly high degree of agreement between the judges' and the actual grouping of the drawings was found. An analysis of the ages of children whose drawings were grouped together by the judges showed a tendency to place older children in the groups whose drawings were considered more mature by the judges. Even with this factor considered, however, there was a much smaller proportion of older Virgin Island children included in the more mature groups, so that cultural factors seemed to have greater influence.

The drawings were analyzed in an effort to determine whether characteristics were found common to a majority of all four cultural groups. Only six traits appeared but thirty-four of the drawing characteristics studied were found to occur in less than ten per cent of all the drawings.

Age and sex differences were investigated. Comparatively few differences attributable to these factors were found when all the groups were combined. The cultural differences predominated in all such comparisons made. It was observed that the commonly found tendency in the United States to draw a figure of the same sex first, was not true of the Virgin Island children who drew the male sex first in most instances.

From historical and sociological data available about the St. Thomas Negroes, certain salient psychological factors were abstracted. A comparison was made of these factors with those revealed through an interpretation of the drawing characteristics occurring in more than half the Virgin Island Negro group. Although there were a few discrepant features which could not be explained on the basis of information available, there was general agreement.

Microfilm copy of complete manuscript of 230 pages, \$2.88. Enlargements 6" x 8", 10¢ per page. Library of Congress card number MicA54-557.

# THE EFFECT OF SELECTED INCENTIVE CONDITIONS ON THE PERFORMANCE OF PSYCHOPATHIC, NEUROTIC, AND NORMAL CRIMINALS IN A SERIAL ROTE LEARNING SITUATION

(Publication No. 6940)

George William Fairweather, Ph.D.  
University of Illinois, 1953

This investigation was designed to study the relationship between learning and motivation in psychopathic, neurotic, and normal criminals. The impressions of various clinical authorities about the psychopath and neurotic as learners and Hull's learning theory were utilized to predict the performance of these groups. Clinical authorities seem to agree that the neurotic carries a "maximal load" of anxiety while the psychopath appears to exhibit little or none. This dimension, anxiety, may be treated as drive (D) and subsumed under the topic of motivation which also encompasses the incentives operative in the environment.

Selected authorities have advanced two opposed views concerning the learning ability of the psychopath. Karpman, Henderson, and others believe that the psychopath cannot be motivated to learn, and Aichhorn, Pennington, et al, have shown clinically that he can learn under incentive conditions of uncertainty. Conversely, clinical evidence suggests that the neurotic, highly "loaded" with anxiety, will



show a decrement in performance under this condition of uncertainty.

This distinction provided the basis for the development of the hypotheses that: a psychopathic group will learn better under an incentive condition of uncertainty than under a normative or no incentive condition; a normal group will learn equally well under all three incentive conditions; a neurotic group will learn best under a condition of no incentive, less well under normative incentive, and worst under uncertainty.

To test these hypotheses, ninety subjects incarcerated in an Illinois State Penitentiary were stratified into three groups designated as psychopathic, neurotic, and normal. These subjects learned a list of ten nonsense syllables to a criterion of twenty-five trials under three different conditions: (1) a control condition of no incentive; (2) a normative incentive condition where two packages of cigarettes were given each subject; and (3) a condition of uncertainty where two packages of cigarettes were given the subject provided he reached a criterion score unknown to him at the time of learning.

The effects of intelligence, age, and education were eliminated statistically. The total number of correct anticipations earned by each subject was utilized as the measure of learning. The experimental hypotheses were subjected to test by the use of an analysis of variance design.

The results show:

1. The psychopathic and psychoneurotic subjects learned better under the normative incentive condition than under the no incentive control condition. They learned best under the condition of uncertainty. Comparisons of the incentive conditions with the control condition showed that the uncertainty group, alone, learned at a significantly faster rate.

2. The normal criminals learned best under the condition of uncertainty and worst under the no incentive condition. Learning under the normative incentive condition fell between these two. None of the differences between the normal groups reached statistical significance.

3. When the psychopathic, psychoneurotic, and normal subjects were considered as groups, the difference between their mean performances were significant at the .001 level. The performances of the former two classes were approximately equivalent, but that of the latter was far superior to either pathological group.

4. When the performance of all subjects was categorized according to the incentive conditions, the mean scores in order of magnitude were uncertainty, normative, and no incentive. The differences between these means were statistically significant at the .01 level.

It was concluded that the performance of the psychopaths supported the contentions of Aichhorn, Pennington, and others concerning the learning ability of the psychopath and indicated that the position held by Karpman, Henderson, et al, is untenable. When the neurotics are considered as "neurotic characters", as defined by Pennington, the performances of all subjects can be accounted for by Hull's theoretical concepts.

Microfilm copy of complete manuscript of 70 pages, \$1.00. Enlargements 6" x 8", 10¢ per page. Library of Congress card number MicA54-558.

# PERSONAL PROBLEMS OF JUNIOR HIGH SCHOOL CHILDREN IN RELATION TO INTELLIGENCE, SOCIOECONOMIC STATUS, SEX AND SCHOOL GRADE

(Publication No. 7040)

Paul Leroy Hill, Ph.D.  
Northwestern University, 1953

The present study was undertaken to determine the extent to which the personal problems of junior high school children are associated with the factors of intelligence, economic status, sex and grade level. The nature and extent of personal problems were determined by administering the Mooney Problem Check List, Junior High School form, to 212 boys and 191 girls in grades six, seven and eight in a suburban junior high school. The group as a whole was considerably above average in intelligence and socioeconomic status. Intellectual level was determined by the California Test of Mental Maturity. From the total group, the upper, middle and lower ten per cent were selected for comparisons. A few children, having had the Otis Classification Test, were included on the same basis, using local percentile norms for this test. Economic status was assumed to be related to number of rooms in the home. The total group, divided approximately into thirds, was used in these comparisons. The lower third included homes of seven rooms and less; the middle third included eight and nine room homes; the upper third included homes of ten rooms and larger.

The data are presented in terms of mean problem frequency scores for the various levels of intelligence, for the three economic groups, for the three grade levels and for the sexes. Each interaction of two of these variables is also analyzed.

For the group as a whole, school adjustment difficulties rank first in frequency of occurrence. The next most frequent categories are Self-centered Concerns and concern about People in General. The least frequent problems are concerned with Home and Family, and with Money, Work and the Future.

The high ability children mark a smaller number of problems than the medium and low ability groups. This is most apparent in the area of school related problems and is consistent in all analyses of the data. The three ability groups do not differ significantly in number and distribution of problems related to home and family and the sexes are not differentiated on any of the seven problem areas. In terms of grade level, on the other hand, there is a significant increase in problem frequency from grade six to grade seven, with some additional increment to grade eight. There is a consistent, though statistically insufficient tendency for the middle economic group to indicate fewer problems than the lower and upper groups.

Considering differences among I.Q. levels for the sexes separately, there is a marked tendency for high I.Q. boys to show more concern about boy-girl relationships while for girls it is the low I.Q. group which has the highest frequency of problems in this area. Analyzing adjustment in terms of both intelligence and grade level, it is seen that sixth graders appear to have more intense problems of adjustment and that intellectual ability plays a relatively larger part in the felt success of adjustment at this level. Viewing sex differences by grade level reveals an increase in concern about home and family problems from the sixth to the eighth grade, with girls showing the increased concern earlier than boys. Boys tend to show an earlier concern about work and economic status whereas girls show an earlier and greater concern about social and personal relationships.

Hypotheses are offered for the above findings and implications for curriculum changes are suggested. Further implications for the in-service training of present teachers and the training of new teachers are indicated.

Microfilm copy of complete manuscript of 53 pages, \$1.00. Enlargements 6" x 8", 10¢ per page. Library of Congress card number MicA54-559.

#### TEST PERFORMANCE AS RELATED TO ORDER OF ITEM DIFFICULTY, ANXIETY AND INTELLIGENCE

(Publication No. 7050)

Kenneth Wilhelm Lund, Ph.D.  
Northwestern University, 1953

Standard practice in arranging test items is to place the easier items first and the remaining items in the order of progressively increasing difficulty with the more difficult items last. This procedure has the status of years of practice and is consistently recommended by authors writing in the field of test construction. Although there is agreement that this is an important procedure for good test construction, there is no consistent agreement as to the reasons for this special precaution in test construction. A careful search of the pertinent research literature has not revealed a comprehensive experimental study which directly investigates the effect of item arrangement on test performance.

To study the effect on test performance of changes in order of presentation of item varied with respect to difficulty, two forms of an intelligence test were constructed, using types of items commonly found in the standardized intelligence test having verbal, arithmetic, and reasoning content. Two matched groups of 90 subjects each from the freshman class at a junior college were given the tests. To the first group Form A with the items arranged in the conventional easy to hard order was presented. To the second group Form B was presented, with the most difficult 25% of the items now

occupying the first position in the test and the remaining 75% following the conventional arrangement. Provisions were made in the statistical design, through the use of the analysis of variance technique, to study the differential performance by subjects with varying levels of intelligence, varying levels of anxiety and the interactions of these factors. Unlimited time was provided and the subjects were urged to answer all questions in order to minimize the effect of time lost on difficult items.

The results indicate that changing the order of items did make a significant difference in test performance, with the arrangement that placed difficult items first resulting in a decrement in score. However, as performance was not lowered on the comparatively easy items which directly followed the hardest items in Form B, the hypothesis of a disruptive effect must be rejected. Similarly, no significant difference was found in test performance as related to the level of anxiety of the subjects. The change in item order resulted in a decrement in performance at all levels of intelligence. It would seem possible to conclude that changing the order of items resulted in a lower performance for subjects at all levels of intelligence and for all levels of anxiety. Even though the time factor was minimized by allowing unlimited time, a decrement in score was noted. The subjects were sophisticated with respect to psychological tests, but a change in performance occurred, indicating that order has significance for more than naive subjects.

The change in the motivation level of the subjects is the only adequate explanation for this decrement in performance. When the subject encounters items early in the test that are extremely difficult his ability to answer easy items is not significantly altered. However, his experience of failure results in a lowered motivation level that makes the subject reluctant to confront subsequent difficult items and significantly lowers his performance score. Therefore, it is essential that the standard practice of arranging test items in the conventional order of difficulty be continued in order to provide a consistent optimum level of motivation among the subjects.

Microfilm copy of complete manuscript of 70 pages, \$1.00. Enlargements 6" x 8", 10¢ per page. Library of Congress card number MicA54-560.

#### A PSYCHOSOMETRIC INVESTIGATION INTO PROBLEMS OF COLLEGE FRESHMEN

(Publication No. 7103)

William G. Meyer, Ph.D.  
New York University, 1953

#### Origin and Purpose

Skeptical about the results of current paper and pencil problem check tests, the writer set himself the task of devising a better method of identifying problem areas of subjects, and, if possible, to measure the amount of disturbance which these problems



created. A further aim was to demonstrate the use and results of the devised method by testing fifty college freshmen.

#### Method

Based on the psychosomatic theory of the unity of mind and body, many experiments were conducted to ascertain whether or not involuntary physiological changes in subjects were reliable indicators of psychic disturbance.

To accurately describe this technique, the word "psychosometric" was coined, indicating the measurement of the interaction of mind and body. The word "problem" was defined as any situation that disturbed the homeostatic equilibrium of an organism.

During early experiments different individuals were confronted with unpleasant stimulus situations, while a battery of sensitive recording instruments registered the subject's respiration, psychogalvanic skin response, heart beat, blood pressure, voice, and oral comments.

Subsequent experiments substituted irritating words and embarrassing questions for concrete, unpleasant stimulus situations. Silent interviews were conducted to discover whether the subject's mental efforts in answering questions were responsible for the organismic changes, or whether the questions themselves caused the upheaval. The test-retest method was applied to study the consistency and reliability of a person's psychosomatic behavior.

McNeeley's survey<sup>1</sup> revealed the college campus to be a fertile field for investigating personal problems. Because the majority of students who drop out of college do so during their first year, the writer limited his investigation to problems of freshmen.

With the kind permission of Dr. Evan R. Collins, President of New York State University's College for Teachers at Albany, the writer psychosometrically interviewed fifty freshmen in an effort to discover what their problems were.

#### Results

The graphic evidence tended to support the psychosomatic theory. All subjects tested manifested major and sudden physiological changes when confronted with unpleasant stimuli, although organisms differed in their individual reactions.

The amount of organismic disturbance was found to be in direct proportion to the degree of unpleasantness experienced by the subject.

Irritating words or questions evoked the same physiological changes in subjects as did concrete stimuli, such as the severed, bloody head of a chicken or the sight of creepy salamanders.

Measurement of the degree of disturbance was made possible by comparing the amounts of physiological change which irritating stimuli called forth in an individual.

The silent interviews revealed that the pointed stimulus questions themselves rather than the subject's replies evoked his organismic disturbances.

Retests confirmed psychosomatic consistency by showing the same disturbances in the same indi-

viduals who responded to the same stimuli twenty-four hours after the first interview.

The data also clearly brought to light that freshmen had more problems than they had reported to the examiner before the interview.

The ten most frequent problems of the present freshman class of Albany State Teachers College were found to be:

1. Subjects
2. Food
3. Boy-friend
4. Time
5. Girl-friend
6. Students
7. Sex-life
8. Professors
9. Room-mate
10. Social life

The ten most intensely felt problems, however, were:

1. Girl-friend
2. Boy-friend
3. Room-mate
4. Sex-life
5. Draft board
6. Subjects
7. Loneliness
8. Coming to State
9. Sororities
10. Social life

#### Conclusion

The psychosometric method, as employed in this investigation, enabled the examiner to accurately identify the problem areas of his subjects, and to correctly measure the amount of disturbance which these problems created.

Application of the present technique in psychiatry and clinical psychology should furnish the therapist a reliable diagnosis of his patient's difficulties - a necessary prerequisite for effective treatment.

1. McNeeley, J.H., "College Student Mortality," U.S. Office of Education Bulletin, 11:1-112, 1937.

Microfilm copy of complete manuscript of 612 pages, \$7.65. Enlargements 6" x 8", 10¢ per page. Library of Congress Card number MicA54-561.

#### THE EFFECT OF TESTOSTERONE UPON CERTAIN ASPECTS OF PERSONALITY IN MALE PARAPLEGICS

(Publication No. 7104)

Julian S. Myers, Ph.D.  
New York University, 1953

The purpose of this study was to determine by controlled experimentation whether testosterone produces personality changes in male paraplegics, and if so, whether these changes are related to the physio-chemical action of the hormone or to extraneous factors such as suggestion and attention. Specifically, the following problems were investigated:

Does administration of testosterone result in increased muscular and mental efficiency?

Does administration of testosterone result in an increased sense of bodily well-being?

Does administration of testosterone produce a decrease in anxiety and depression, and an increase in assertiveness and drive?

If changes are produced, do they affect a superficial level of personality, or do they affect the basic personality structure?

Are changes related to the chemical action of the hormone or to extraneous factors such as suggestion and attention?

Are changes related to the sexual potency of the subject?

The subjects were limited to twenty male white paraplegics who were treated at the rehabilitation facilities of the New York University - Bellevue Medical Center from May 1951 to June 1952. Only patients whose disability resulted from transverse myelitis were used. Subjects were between the ages of eighteen and fifty, had at least a third grade education, and were able to sit in a wheelchair. Patients with brain injuries or active infections processes, or who were receiving any form of drug therapy or surgery were excluded.

To control the effects of such factors as suggestion and attention, a placebo of sesame oil was used half of the time. The subjects were not aware of this. All of the odd-numbered subjects were given daily intramuscular injections of one cubic centimeter of testosterone propionate (fifty milligrams) for a period of fourteen days, followed by daily injections of one cubic centimeter of sesame oil for fourteen days. The procedure was reversed with the even-numbered subjects who received the placebo for fourteen days followed by testosterone injections for fourteen days. Subjects were interviewed and given a battery of psychological tests three times, i.e. prior to all injections, following the testosterone injections, and following the placebo injections. Results following the testosterone injections for all subjects were then combined and compared with results following the placebo injections and the initial test results.

Mental efficiency was measured by Digit Span and Digit Symbol tests taken from the Wechsler Bellevue Intelligence Scale. To measure muscular efficiency and fatigue, a device was built which tabulated the number of weighted ping-pong balls which a subject could pick up and place in a five-minute period. The Psychosomatic Inventory was used to measure the subjects' sense of bodily well-being and superficial aspects of personality. The Thematic Apperception and Rorschach Tests were used to evaluate basic personality structure and the specific factors of anxiety, depression, assertiveness and drive.

For the group as a whole, none of the results following treatment with testosterone were significantly higher than results following treatment with the placebo and results of the initial test. In terms of the population studied, the chemical action of the hormone did not have a beneficial effect upon

efficiency or personality. This is at variance with the findings of earlier investigators who studied different populations. Extraneous factors such as suggestion and attention, the rehabilitation program, and fluctuations in interpersonal relationships appear related to moderate improvement in efficiency and emotional adjustment.

Subjects were classified as sexually impotent, potent on a reflex basis or potent on a psychic basis. The middle group showed statistically significant improvement in muscular efficiency scores. All the other results were negative.

Microfilm copy of complete manuscript of 200 pages, \$2.50. Enlargements 6" x 8", 10¢ per page. Library of Congress card number MicA54-562.

#### A STUDY OF THE CONCEPT OF THE IDEALIZED IMAGE IN RELATION TO SIMILAR CONCEPTS AND TO CERTAIN PSYCHOLOGICAL EXPERIMENTS

(Publication No. 7110)

Robert Killian Robison, Ph.D.  
New York University, 1953

This is a study designed to investigate: (1) to what degree Karen Horney's concept of the idealized image - an idealized self-concept - resembles similar concepts advanced by other theoreticians; and (2) to determine to what degree, if any, Horney's concept is supported by psychological experiments.

This study of psychological theory was undertaken in order to: (1) assist in clarifying self-problems, thus abetting a revision of the theoretical foundations of psychology; (2) to aid in furthering the scientific search for the self; (3) to demonstrate common areas of agreement among various theoreticians, thus reducing semantic confusion in psychology; (4) to assemble the available evidence for the idealized image from psychological experiments, in this way aiding in implementing the convergence of psychology and psychoanalysis; (5) to show the far-reaching consequences of this idealized self-concept and thus shed light on major philosophical considerations.

Previous writers have noted common strains of agreement in the writing of all psychoanalytically-oriented psychiatrists, and a number of experimentalists have studied psychoanalytic concepts in the laboratory. But no one has inquired into the areas of agreement bearing on the concept of the idealized image or the process which ensues from it: self-idealization.

To this end the principal works of the major psychoanalytic writers were studied and the constructs relating to self-idealization noted. Point for point concepts were compared as to theoretical, operational, and therapeutic aspects. Constructs relating to self-idealization promulgated by miscellaneous theoreticians were treated in the same manner. Twenty-two leading psychological and psychiatric



journals from 1930 to 1951, and the *Psychological Abstracts* from 1927 to 1951 were culled to ascertain what experiments in the psychological literature were related to the idealized image or to similar constructs. To aid in defining to what degree these constructs are supported by research, these experiments were classified into areas applicable to the concept of the idealized image or to similar concepts, thus: self-concept; self-deception; ego-involvement; body-image; perception; frustration; level of aspiration; selective recall; dominance; learning; miscellaneous experiments and articles. In all instances an attempt was made to correlate as specifically as possible experimental findings with the theoretical, operational or therapeutic aspects of the concept of the idealized image, the process of self-idealization, and similar formulations.

Both major hypotheses were rejected: (1) the idealized image, while descriptively and behaviorally similar to other concepts, is, operationally, unique in that it resolves inner conflicts by self-idealization; (2) research supports various behavioral and operational manifestations of the idealized image and the process of self-idealization to varying degrees, but the construct of the idealized image, per se, has only limited experimental support.

Though both major hypotheses were rejected, a number of conclusions can still be formulated on the basis of this study: (1) the phenomenon of self-glorification, in the sense of narcissism and self-aggrandizement is widely recognized, and the experimental evidence for it is adequate; (2) the problem of inner conflicts, a psychological prerequisite to the creation of the idealized image, is acknowledged by a number of writers, and the experimental evidence for the phenomenon of inner conflicts is strong; (3) the process of self-idealization as a created lifestyle is recognized to a lesser degree, and the experimental evidence for the various aspects of self-idealization varies markedly; (4) the three main characterological types resulting from self-idealization according to Horney are corroborated by many writers and are strongly supported by research.

Microfilm copy of complete manuscript of 342 pages, \$4.28. Enlargements 6" x 8", 10¢ per page. Library of Congress card number MicA54-563.

THE EFFECTIVENESS OF A RORSCHACH PROGNOSTIC SCALE FOR PREDICTING RESULTS IN PSYCHOTHERAPY: A STUDY OF THE RELATIONSHIP BETWEEN A RORSCHACH PROGNOSTIC RATING SCALE, AND THE IMPROVEMENT STATUS OF PSYCHONEUROTIC AND AMBULATORY SCHIZOPHRENIC VETERANS UNDERGOING INDIVIDUAL PSYCHOTHERAPY

(Publication No. 7111)

Harry Rockberger, Ph.D.  
New York University, 1953

This investigation attempted to determine the effectiveness of a Rorschach Prognostic Rating Scale (referred to as the RPRS), and psychiatric diagnosis for predicting progress in psychotherapy with psychoneurotic and ambulatory schizophrenic patients. It was hypothesized that the RPRS would be an adequate predictive instrument and that diagnostic label did not necessarily indicate prognosis.

The subjects were thirty-six non-hospitalized white male veterans attending the Mental Hygiene Clinic in Newark, New Jersey. There were twenty-three schizophrenics and thirteen psychoneurotics. The veterans were receiving individual psychotherapy and had been seen for periods ranging from six to forty-one months. The therapists were psychiatrists, clinical psychologists, and psychiatric social workers.

The therapists were asked to rate improvement in each of thirty-two areas. This yielded a numerical score, presumably a measure of the degree of improvement. Further, the therapists gave a single "Yes" or "No" general improvement statement based on a certain criteria.

A rationale was developed for the RPRS.

The RPRS was correlated with both improvement indices. A prediction formula, based on the results achieved with twenty-four randomly selected subjects, was applied to the remaining twelve subjects.

The RPRS was correlated with the diagnostic categories so as to obtain a measure of its variance as regards diagnosis. The diagnostic categories were then correlated with improvement status and a prediction formula applied to the same twelve subjects mentioned above.

Those variables believed to have a possible relationship to outcome in psychotherapy and to the RPRS, were investigated.

The results of this study were as follows:

1. The RPRS correlated significantly with both improvement indices. The RPRS was unable to significantly predict degree of improvement, but was significantly accurate when a coarse ("Yes" or "No") index of improvement was used as a criterion, and to that extent affirmed the hypothesis that the RPRS is an adequate predictive instrument. The adequacy of the RPRS was explained by the Scale's sensitivity in measuring those propensities (Ego strength) which seem important to a successful outcome in psychotherapy.

2. The RPRS was significantly correlated with the diagnostic categories. However, approximately sixty-four per cent of the subjects were found to

overlap in the mid-range. This latter finding indicated that there was a group of psychoneurotics and schizophrenics who apparently had similar personality characteristics.

3. The diagnostic categories were found to be significantly correlated with the improvement status. Using the diagnostic category as a prognostic indicator, prediction was found to be significantly accurate. This finding indicated that the hypothesis concerning diagnostic category was, in the main, not substantiated. Apparently the majority of schizophrenics, in comparison with the majority of psychoneurotics, did not have the same propensities for growth in psychotherapy within the setting of this investigation. However, one-sixth of the subject population responded differently to psychotherapy than what the diagnostic label implied. This was taken to mean that there is a borderline area where-in diagnostic label is not an adequate prognostic indicator.

4. A comparison of the prognostic ability of the RPRS and diagnostic categories indicated that both indices were about equally effective in predicting improvement status.

5. Education, I. Q., age, and time in therapy were found not to correlate significantly with improvement status.

6. The RPRS was found to be significantly correlated with both the I. Q. and educational level. However, when both these variables were held constant, the correlation with improvement status in each did not differ significantly from that achieved without holding these variables constant.

Microfilm copy of complete manuscript of 162 pages, \$2.03. Enlargements 6" x 8", 10¢ per page. Library of Congress card number MicA54-564.

#### A COMPARATIVE EVALUATION OF THE REACTIONS TO FRUSTRATION OF DELINQUENT AND NON-DELINQUENT MALE ADOLESCENTS

(Publication No. 7116)

A. Eugene Shapiro, Ph.D.  
New York University, 1953

The purpose of this investigation was to evaluate and compare the trend of reactions to frustration of delinquent and non-delinquent male adolescents. The specific problems related to the main problem were: (1) Did delinquents and non-delinquents differ in their trend of reaction to frustration as measured by a test technique? (2) In what way did an interpersonal frustration and condemnation situation effect the trend of reaction to frustration of delinquent and non-delinquent adolescents? (3) In what way did an interpersonal success and praise situation effect the trend of reaction to frustration of delinquent and non-delinquent adolescents?

Forty delinquents (stealers) were equated to

forty non-delinquent subjects for age (14-17); I. Q. (85-115) and socioeconomic status. They were given the Rosenzweig Picture-Frustration Study (hereafter called the P-F Study) to complete. The tests were evaluated and the trend of reaction to frustration for the two groups was established. The delinquent group was then divided into two groups of subjects equated for C. A., I. Q., and for the number of extrapunitive (E), intro-punitive (I) and impunitive (M) type of responses on the P-F Study.

A period of two weeks was permitted to elapse from the time of taking the preliminary P-F Study. One group of subjects was individually given an experimental interpersonal frustration and condemnation situation. In the frustration situation the subject met with five consecutive failures in his attempts to build blocks to duplicate a design. He was then given his scoring sheet which was marked, "Very Poor." Immediately thereafter he was given his second P-F Study to complete. The other group of delinquent subjects had a success and praise situation for the experimental variable. Success was accomplished by permitting the subject to complete his designs. His scoring sheet was marked, "Excellent."

The same procedure that was employed for the delinquent sample was employed for the non-delinquent sample.

The number of responses in each scoring category on the preliminary Rosenzweig P-F Study for the delinquent and non-delinquent sample were compared for differences between means (*t* test) and differences between sigma deviations (*F* test) to determine trend of reaction.

The results of the post P-F Study were compared with the results on the preliminary P-F Study, for each group, for the number of extrapunitive, intro-punitive and impunitive types of responses. The *t* test and *F* test were used respectively to determine the mean differences and the amount of variability after the experimental situation.

The results of this study indicate that the delinquent reacts against barriers causing frustration more often than does the non-delinquent. The non-delinquent, however, personally tries to seek a solution to frustrating situations more often than does the delinquent. Furthermore, while the delinquents' and non-delinquents' trend of reaction to frustration is not altered by an additional frustrating situation, the delinquents, as a group, react more nearly alike after the additional frustration. After a success situation the delinquent's reaction to frustration is altered. He is less apt to express his aggression on to the environment and is more likely to gloss over the frustrating situation. The non-delinquents' reaction to frustration is not altered by additional frustration nor by success, which seems to indicate that the non-delinquents' trend of reaction to frustration is more stable than the delinquents'.

The results of this study seem to have implications toward institutional treatment of delinquents. Primarily, the utilization of punishment or frustration does not bring about positive change, but rather seems to bring about a rigidity in coping with



frustration. Positive changes in the delinquent's ability to handle frustration seem to be induced by emphasis upon the success and praise approach in treatment.

Microfilm copy of complete manuscript of 183 pages, \$2.29. Enlargements 6" x 8", 10¢ per page. Library of Congress card number MicA54-565.

# AN INVESTIGATION OF SOME PERSONALITY CORRELATES DURING THE CLINICAL COURSE OF TUBERCULOSIS

(Publication No. 6912)

John Henry Vitale, Ph.D.  
Stanford University, 1953

This study was designed to test experimentally the hypothesis that personality components are related to the clinical course of tuberculosis. A review of the literature led to the belief that patients whose tubercular disease was becoming progressively worse (declining) were psychologically more defensive than patients whose disease was becoming progressively better (improving).

Two matched groups of male, veteran pulmonary tuberculosis patients, one whose course was declining and the other improving, were compared for the purpose of testing differential predictions of defensiveness. The observed data confirmed the expectation that the declining group would be characterized by greater defensiveness concerning dependence, anxiety, activity level, self-esteem, and productivity in a goal setting task. The groups did not differ on hostility; the declining group was less cautious than the improving group both in its overall goal setting behavior and also following a failure experience during goal setting, and the declining group was more responsible than the improving group. The latter two findings were contrary to expectation.

Comparison of the Minnesota Multiphasic Personality Inventory profiles of the present groups with that of previous reported tubercular samples revealed that the profiles were similar in configuration, but that the elevation of the profiles of the present groups was higher than that of previous samples. The increased elevation of these profiles for the present sample was believed to be partially dependent on the greater mean age of the present sample and the longer mean length of hospitalization at the time of testing. When normal groups were compared with the present sample of tubercular patients on measures of self-esteem and goal setting behavior the declining group tended more nearly to resemble the normal group in its performance on these measures.

The failure to predict certain of the data, especially that pertaining to hostility, led to the judgment that the present study provides partial confirmation of the hypothesis relating personality features to clinical course of tuberculosis, with the recommendation that the hypothesis be investigated further.

The demonstration of the heightened psychological defensiveness of the declining group over that of the improving group was judged to be extremely important for the planning and implementation of treatment programs for tuberculosis.

A revision of the hypothesis was proposed wherein it was suggested that dependency is a most serious area of possible conflict because a dependent role is emphasized in the tubercular's environment. It was also suggested that the declining group in its effort to maintain a normal psychological orientation in the hospital inevitably experienced conflict, frustration, and tension to a greater degree than did the improving group which adopted the dependent role more easily.

The findings of the study relating heightened defensiveness and tension states to poor recovery from tuberculosis are consistent with the findings in other populations; namely, those involving cancer and recovery from surgery.

The demonstration of a relationship between psychologically defensive behavior and clinical course of tuberculosis contributes another source of variation to be evaluated in detecting the individual who is more susceptible to contracting tuberculosis.

Microfilm copy of complete manuscript of 108 pages, \$1.35. Enlargements 6" x 8", 10¢ per page. Library of Congress card number MicA54-566.

## PSYCHOLOGY, EXPERIMENTAL

### TESTS FOR EFFECTS OF IONIZED AIR AND ELECTROCONVULSIVE SHOCK ON LEARNING AND INNATE BEHAVIOR IN RATS

(Publication No. 6888)

Frank Joseph Bauer, Ph.D.  
Stanford University, 1953

The review of a large and controversial literature indicated that ventilation engineers, hygienists, and therapists still are interested in the question of whether a predominance of negative or of positive ions in the atmosphere produces any effects on living organisms. The basic hypotheses are that negatively ionized air is essentially beneficial in its effects on biological, physiological, and psychological processes, whereas positively ionized air is detrimental.

To test for effects of unipolarly ionized air and electroconvulsive shock (ECS) on learning, 138 male white rats in six groups were given 31 daily trials on a multiple-U water maze. Groups I and II lived in positively ionized air (6000 positive small ions per cc. of air), Groups III and IV lived in negatively ionized air (3500 negative small ions per cc.), and Groups V and VI lived in normal air. All groups lived in small chambers in which the ion concentration and the rate of air exchange could be controlled;

ions were produced by Wesix polonium-source ion generators. Each S in Groups II, IV, and VI was subjected also to one ECS approximately 30 minutes after completion of each of the first 10 maze trials.

In the second experiment, 60 male white rats in 5 groups were tested for effects of unipolarly ionized air and ECS on nest building during a period when daily minimum temperatures ranged between 45° and 61° F. Group A lived in positively ionized air (6500 positive ions per cc.), Group B lived in negatively ionized air (3000 negative ions per cc.), Groups C and E lived in normal air in cages in small enclosed chambers, and Group D lived in normal air in cages in a larger room. Subjects in Groups A, B, and C were subjected to one ECS daily for 10 consecutive days.

The first experiment provided no evidence that the maze learning behavior of rats, as measured by time and error scores, was modified in any way by unipolarly ionized air under the given experimental conditions. But analyses of the data provided statistically significant evidence that ECS markedly retards learning. However, after the shock period there was a gradual recovery from the adverse effects of ECS. Hypotheses that negatively ionized air would have retarding effects on learning and on recovery from ECS were not supported.

That ECS has a seriously disruptive effect on the nest building behavior of male white rats was indicated by both statistical and graphic analyses of data. After the shock period there was a gradual return of nest building activity; however, there was no statistically significant evidence to support hypotheses that negatively or positively ionized air have differential effects on such recovery. The reliability of the nest rating scale was established (mean  $r = .91$ ).

Evidence that unipolarly ionized air was produced in a quantity and quality necessary to satisfy the demands of the investigation was evaluated. Suggestions are given for further study of possible effects of ionized air.

As a by-product of the study, evidence was presented to support psychological hypotheses ascribing the deleterious effects of ECS to "retroactive inhibition" factors and to "disturbances of perception". An evaluation was made of possible organic factors which may underly the psychological effects. Further tests of the given hypotheses are proposed.

As another by-product of the study, a question was raised about possible effects of early experience in a cold environment on the later nest building activity of mature male white rats. Also bionomic factors relative to nest building are discussed as prospects for further research.

Microfilm copy of complete manuscript of 158 pages, \$1.98. Enlargements 6" x 8", 10¢ per page. Library of Congress card number MicA54-567.

## SECONDARY DRIVE AS A NEUTRALIZER OF TIME IN INTEGRATIVE PROBLEM SOLVING

(Publication No. 6919)

Vertus Edwin Bixenstine, Ph.D.  
University of Illinois, 1953

In its widest setting, this study is an effort to account with the principles of stimulus-response psychology for integrative behavior which has heretofore been chiefly the concern of "Ego" psychology. In another sense, it is an extension of a study of time as a determinant in integrative learning by Mowrer and Ullman (*Psychological Review*, 1945, 53, 61-90). In this study, two symbolic cues are supplied to the rat-subjects to mediate the integration in the place of the one symbolic cue supplied by the Mowrer and Ullman. Under test is the hypotheses that time will not limit integrative behavior if symbols are provided which permit the animal to discriminate the occasions for gratification without subsequent punishment from those occasions when gratification must be avoided to avoid subsequent punishment.

Mowrer and Ullman defined integration as "that mode of behavior which serves to reduce the more powerful of two (or more) conflictful drives even when this drive and its reduction or avoidance occurs some considerable time after the crucial act." Operationally, they taught rats to approach and eat from a food-trough at the sounding of a buzzer. Once this was well learned, something analogous to a "taboo" was introduced. If the animals took the food within three seconds after the buzzer began, they received an electric shock at 3, 6, or 9 seconds after the termination of this three-second, "taboo" period. Here integrative behavior consisted in avoiding the food for the three-second "taboo" period and then taking it thereafter. To help the animals avoid the non-integrative act of taking food within the "taboo" period with its consequent, but relatively remote, punishment of shock, the buzzer was continued throughout the three-second "taboo" period. If the rat took food during this period, the buzzer continued sounding till the rat was shocked. Thus, the buzzer signal acquired two references, one to food-in-trough, and another, to the impending shock-punishment. As a symbolic cue, it was ambiguous. Under these symbolic conditions, Mowrer and Ullman found that integrative behavior was an inverse function of the remoteness of the punishing shock.

### Method

In the present study, rats were again taught to approach a trough and to eat food at the sounding of a buzzer. Once the rats learned this, again a "taboo" was introduced. If the animals took the food within a specified period (of 10, 20, or 40 seconds for each of three sub-groups) following the buzzer, they were shocked, but after an interval of delay (of 20, 50, or 110 seconds for each of three sub-groups). With one group of 18 animals (divided into sub-groups for "taboo" periods and intervals of delay for analysis of variance), the light in the



apparatus began to blink whenever the rat approached within three inches of the food-trough during the "taboo" period. If the animal withdrew without taking the food, the light stopped blinking and became continuous again. If the rat took the food during this "taboo" period, the light continued blinking until the period had elapsed. The blinking light came on again for three seconds prior to each application of shock following such a "non-integrative" act. Thus, in this experiment, the rats were supplied with two symbolic cues, a buzzer signifying food, and a blinking light signifying the impending shock-punishment. These externally supplied signs are conceived to be analogous to those response-produced symbols which human beings supply themselves.

Another group of 18 animals were submitted to the same sequences of experience except for the fact that the blinking light did not reappear before each application of the shock-punishment. Thus, the blinking light was unconnected with the shock-punishment. If the blinking light was to have any reference to shock, the rats were obliged to make their own connection, and such a connection was presumed to depend upon a stimulus trace.

This whole arrangement was replicated with two groups of nine rats, except that there was no food in the trough during the "taboo" period. For a third group of nine, the blinking light was omitted entirely in order to determine whether the absence of food aided the rat in discriminating the "taboo" period.

#### Results

With these two symbolic cues supplied, one signifying gratification in the form of food, and the other signifying punishment in the form of shock, the rats in this experiment, unlike those of Mowrer and Ullman, were enabled to behave integratively, i.e., to delay taking food until after the "taboo" period, even when the "taboo" period was as long as 40 seconds. Moreover, this capacity was unaffected by delay of the shock punishment even up to 110 seconds. These results are seen to confirm the hypothesis that time is no limiter of integration, thus defined, when a rat is provided with unambiguous symbolic cues.

The behavior of animals lacking the benefit of a cue symbolic of the remote consequences, supports the hypothesis of a stimulus trace of at least 20 seconds of duration when shock-punishment is involved.

Microfilm copy of complete manuscript of 170 pages, \$2.13. Enlargements 6" x 8", 10¢ per page. Library of Congress card number MicA54-568.

#### CHILDREN'S PATTERNS OF RESPONSES IN RELATION TO CRITERIA OF ADJUSTMENT

(Publication No. 6924)

James Franklin Carruth, Ph.D.  
University of Illinois, 1953

Two of McQuitty's tests, representing different types of items were administered to 727 school children, ranging from seventh-grade to seniors in high school. These subjects were classified according to thirteen available criteria of personality maladjustment. Sixty individuals were selected who occurred in five or more of the maladjusted criterion groups. One hundred individuals were chosen to represent those falling into less than five but more than two criterion groups and one hundred were selected to represent those appearing in fewer than three groups. Thus, two hundred and sixty subjects were selected to represent three groups assumed to reflect differences in personality integration. Within each group, proportionate sub-groups were randomly selected to represent each of the five school grades sampled and both sexes. The subjects were scored by McQuitty's Typicality-method which gives an index of the extent to which each individual conforms to the majority pattern of responses.

The results indicate that Typicality scoring is effective in differentiating levels of adjustment within a normally distributed population of adolescents. In addition they indicate that the scores are related to differences between subjects in the period of pre-adolescence and those in later adolescence. The data further suggested that subjective items are more effective with adolescents than are objective items. Taken together, the results are consistent with the hypothesis that adolescent conflict is directly related to poor mental health in general.

Microfilm copy of complete manuscript of 103 pages, \$1.29. Enlargements 6" x 8", 10¢ per page. Library of Congress card number MicA54-569.

#### A DEVELOPMENTAL STUDY OF MOTION PERCEPTION, SIZE CONSTANCY, RECOGNITION SPEED, AND JUDGMENT OF VERTICALITY

(Publication No. 6892)

Robert Durand Edgren, Ph.D.  
Stanford University, 1953

To help evaluate developmental theory by supplying needed reliable data concerning the development of vision, four instruments for group visual testing were devised. The first of these tests was a motion picture in which comparisons of varying speeds of two sets of moving squares could be made, investigating the effects of changes in the distance to, size of, and direction of movement of the standard set of squares. The second test was a set of thirty slides. Twenty-two were in color and showed a row of graduated white stakes in a field. Eight

slides were made from drawings which showed stakes of exactly the same size as those in the outdoor arrangement, but omitted nearly all the common distance cues. In each picture there was a test object more distant than the stakes. The subject selected one of the stakes to match the test object. The size of the stake chosen to match the same test object seen at different distances provided a measure of size constancy. The third test was a set of twenty-five color slides of common objects recognizable, when time was not limited, by very young school children. These objects were to be identified and described in a word or two when shown at 1/100 second. The fourth test presented a line inside a square tilted at  $28^\circ$ ; there were twenty pictures with the line in different positions. The subject selected the one which he thought showed the line in a truly vertical position.

The investigation centered upon the ages from eight to sixteen; these, the "developmental group," included 191 children from elementary and junior high schools in the same district. Eighty-eight other subjects from a college, a reserve officer school, and a fraternal home for the aged provided data to indicate relative visual abilities at older ages, making 279 subjects in all.

Three main theories concerning visual development were taken into consideration: (1) The theory of Koffka, which spoke of development as the maturing of the neural network necessary for visual perception, implying early development, and minimizing the role of experience; (2) the theory of Hebb, which proposed a long, slow development while complex visual associations were learned part by part, and (3) the theory of Piaget which proposed that certain perceptual mechanisms became effective as soon as they were physiologically mature, and that certain others developed slowly, requiring comparisons, analyses, and experience.

The results of the experiment demonstrate significant developmental changes from eight to sixteen years of age in recognition speed and in the reduction of reported size which accompanies the loss of distance cues. These two findings support learning theories implying relatively late development. No significant changes with age occur during the developmental period from age 8 to 16, however, in perceived velocity, in size constancy judgments with the distance cues present, or in verticality judgments. While these results appear to favor Koffka's maturational theory, the possibility remains that learning took place before age eight; therefore, no positive evaluation can be made. The theory of Piaget is in accord with the two general categories of results found in this experiment. An extension of the research with subjects below eight is possible with the present testing instruments, but will require research workers to record the responses of individual subjects.

Microfilm copy of complete manuscript of 103 pages, \$1.29. Enlargements 6" x 8", 10¢ per page. Library of Congress card number MicA54-570.

## SOME PERSONALITY CORRELATES OF THE LEARNING OF THE GALVANIC SKIN RESPONSE

(Publication No. 7094)

Herman Yale Efron, Ph.D.  
New York University, 1953

The problem of this study was: what are some of the behavioral correlates of subjects (Ss) who learn to give a galvanic skin response (GSR) under standard experimental conditions, and what are those of Ss who do not do so under similar conditions. Also, some factors involved in emotional conditioning were testable as a result of the conditioning procedure that was used.

The 100 Ss were male and female members of the elementary psychology classes at the School of Education of New York University, and were tested at Project Clinex. Those Ss who on the basis of the results of 14 conditioning trials met the criteria for conditioning were placed in Group I, while those Ss who met the criteria for nonconditioning were placed in Group II. As a result of this procedure, 24 Ss were placed in Group I and 24 Ss were placed in Group II.

The conditioned stimulus (CS) consisted of a four-second period of music recorded in such a way that there were four static-like interruptions during the first two seconds. This CS was embedded in a matrix of other four-second periods of music. The unconditioned stimulus (US) was an electric shock to the left wrist of the S. The intensity of the shock depended upon the tolerance of the individual S, its duration was .65 seconds, and its onset coincided with the termination of the CS. An exosomatic technique for recording the GSR was used. The S was placed in one arm of a Wheatstone Bridge which was connected to the input of a D. C. amplifier, the output of which drove a recording milliammeter. The psychometric test instruments consisted of the Rosenzweig Picture Frustration Study, the Welsh Anxiety Index, and the Taylor Scale.

A comparison of Group I and Group II on the Rosenzweig Picture Frustration Study showed that the groups do not differ significantly on any of the six variables measured by this test. Similarly, the distribution of scores of Group I and Group II on the Welsh and Taylor Anxiety Scales did not differ significantly.

In addition to comparing the two groups with reference to their performance on standard psychometric instruments, various factors within the records were analyzed. A comparison of Group I and Group II showed that they did not differ in initial reactivity level or amplitude of the UR. Significant differences between the groups were found on the initial resistance level ( $P < .05$ ), the amount of decrease in the UR in two seconds ( $P < .01$ ), and the awareness of the pairing of the CS and the US ( $P < .001$ ).

No significant differences were found between the level of conditioning and the amount of shock and the attitude towards the shock. The hypothesis of the independence of the amount of shock and scores on the anxiety scales could not be rejected.



However, the hypothesis of the independence of the amount of shock and level of resistance was rejected with a high level of confidence ( $P < .02$ ).

The results were discussed and interpreted as being consistent with a drive-reduction reinforcement theory of learning, and not being consistent with the contiguity notion of autonomic conditioning as suggested by Mowrer. The concept of "anxiety" was also discussed and a tentative anxiety scale was proposed.

Microfilm copy of complete manuscript of 96 pages, \$1.20. Enlargements 6" x 8", 10¢ per page. Library of Congress card number MicA54-571.

### SET OR PERCEPTUAL DEFENSE?

(Publication No. 7032)

James Thomas Freeman, Ph.D.  
Northwestern University, 1953

Recent experimental evidence has indicated the importance of a class of behavioral variables which influence perceptual response. One of the principles which has been formulated to describe the behavior of the perceiver in a particular type of perceptual situation is known as perceptual defense. It has been suggested, however, that the data which have been explained by the principle of perceptual defense, i.e., increased recognition thresholds to inimical or taboo material, can more parsimoniously be accounted for in terms of a relative set dominance of the perceiver.

A series of four experiments was performed to determine the influence of set upon a phenomenon which has been described as perceptual defense. All experiments were concerned with the effect of specific types of instructions upon the recognition thresholds of taboo and neutral words. Within the four experiments the following variables were investigated: (1) effect of instructions preparing  $\bar{S}$  for taboo words; (2) effect of instructions preparing  $\bar{S}$  for taboo words but presenting taboo-similar words; (3) sex differences; (4) effect of ego-involvement instructions upon recognition thresholds.

A total of 148 undergraduate students (118 male and 30 female) served as  $Ss$  in experiments which involved the tachistoscopic presentation of taboo and neutral words. All groups of  $Ss$  were matched on the basis of practice day performance. Length of stimulus words was equated as well as frequency of usage where possible. All conditions were constant except the type of instructions which differentiated the control and experimental groups.

The data were analyzed in terms of the recognition thresholds (time) to taboo and neutral words and in terms of pre-recognition hypotheses. The following generalizations describe the data:

1. Conditions producing apparent perceptual defense may be manipulated by varying the instructions given to  $\bar{S}$  - where  $\bar{S}$  is set to expect taboo material, perceptual defense does not occur.

2. Where  $\bar{S}$  is set to expect taboo words, a sensitization effect appears to these words.

3.  $Ss$  may be induced through set to report taboo pre-recognition hypotheses to taboo-similar material.

4. Sex differences to taboo and neutral words were found although the differences in words were largely dependent upon the experimental conditions.

5. Ego-involving instructions tended to lower thresholds to taboo and neutral words; the effect being more pronounced with female  $Ss$ .

It was concluded that the results of the present series of experiments took exception to the principle of perceptual defense and could more easily be accounted for in terms of perceptual principles of greater generality which take into consideration the predominant set of the perceiver.

Microfilm copy of complete manuscript of 58 pages, \$1.00. Enlargements 6" x 8", 10¢ per page. Library of Congress card number MicA54-572.

### MEASUREMENT OF THE ABILITY TO DISCRIMINATE BETWEEN INFERENTIAL AND DESCRIPTIVE STATEMENTS

(Publication No. 7037)

William Valentine Haney, Ph.D.  
Northwestern University, 1953

The purpose of the study was to investigate the concept of uncritical inference behavior, and to measure one of its manifestations. Uncritical inference behavior was defined as the making of a conjecture, supposition, guess, assumption, etc., but thinking and acting as if one had remained with what had actually been observed. One form of uncritical inference behavior is the unconscious identification or confusion of statements of inference and statements of description. A statement of inference was defined as a statement which went beyond what had been observed. A statement of description, on the other hand, can be made only after observation and must stay with what had been observed.

A review of theoretical literature provided ample documentation for the assertion that the inference-description confusion is indeed a phenomenon with which to cope and one which deserves considerable study. The literature of experimentation suggested numerous contributory factors of the behavior. However, research revealed no published test purportedly designed to describe uncritical inference behavior by measuring the ability to distinguish between statements of inference and statements of description. Consequently, it was necessary to construct such an instrument.

The test consisted of brief narratives and statements about the narratives. Subjects were instructed to read the stories carefully and to classify the statements about the narratives as either descriptive or inferential. A descriptive statement was defined, in terms of the test, as a statement which was either directly verified or definitely contradicted by the data contained in the narrative. Inferential statements were those which were neither definitely verified nor contradicted but stated something which went beyond the information in the story.

It was reasoned that should a subject identify or confuse the two types of statements, and thus classify an inferential statement as descriptive, he would necessarily go beyond the data contained in the narrative. In so doing, he would be, in essence, inferring – that is, going beyond what had been observed. Furthermore, since the subject had been instructed to refrain from such identification, it was concluded that he was making the inference without being aware that he was doing so. Hence, by definition, the subject was said to be manifesting uncritical inference behavior.

Coefficients of reliability indicated that the test was sufficiently reliable to discriminate among groups and make coarser discriminations among individuals. Two signs of test validity were demonstrated. First, the items of the test were judged valid by a committee of experts. Secondly, a highly significant improvement in test performance was preceded by special inference-description discrimination instruction.

The uniqueness of the test was established to an extent. Research had revealed no published test explicitly purporting to measure what the Uncritical Inference Test purported to measure. Moreover, representative tests from three areas thought to be related to the Uncritical Inference Test were correlated with the present test. Negligible to moderate correlations indicated that the Uncritical Inference Test is measuring something other than that which is being measured by these representative tests of reading comprehension, verbal intelligence, and critical thinking.

Implications for further use of the Uncritical Inference Test and for further studies in regard to the uncritical inference behavior concept are listed.

Microfilm copy of complete manuscript of 269 pages, \$3.36. Enlargements 6" x 8", 10¢ per page. Library of Congress card number MicA54-573.

#### A COMPARISON OF FACTOR PATTERNS IN A NATIVE LANGUAGE AND AN AUXILIARY LANGUAGE

(Publication No. 6955)

James Foster Kamman, Ph.D.  
University of Illinois, 1953

Results of earlier investigations indicating a decline in intercorrelation among psychological tests with increasing age could be interpreted as evidence of either maturation or experience as determinants of mental organization. Other studies showing a relationship between training experiences and changes in factor patterns suggested the hypothesis that for a single group of subjects, tests in an area of great experience should yield a more complex factor pattern than would tests in an area of relatively limited experience for those subjects.

Tests of problem-solving ability and of achievement in three languages and in two forms (visual and

auditory) were administered to a group of 146 fourth semester students in college Spanish. The languages employed in testing were English (the native language for all subjects), Spanish (the auxiliary language in which all subjects had experienced the same kind and amount of education), and an artificial language devised by the investigator to facilitate transfer of training from the native language.

Twenty-two language test variables described above, together with two non-linguistic tests from the Primary Mental Abilities Test and five achievement variables (grades in Spanish and ratings by instructors) were factor analyzed by the method of principal axes in a series of seven factor analyses, in various combinations of variables.

The results indicate that tests in an auxiliary language learned in college display a relatively greater proportion of their variance in their first factor than do tests in the native language or tests in an artificial language of the type used.

Tests in the native language require a larger number of factors to account for 50 percent of their variance than do tests in the auxiliary language.

The factor pattern for tests in the artificial language differs, in terms of its complexity, from the factor pattern for tests in the native language, in the direction of the factor pattern for tests in the auxiliary language, but the differences between the artificial language factor pattern and the native language factor pattern appear to be small.

The differences between the relatively complex factor patterns in the native language tests and the relatively general factor patterns in the auxiliary language tests, when inter-language maturation is held relatively constant, are similar to the differences found by earlier investigators between the relatively complex factor patterns of adults and the relatively general factor patterns of children. The differences obtained here, then, are explainable in terms of the relatively greater breadth of experience in the native language. The correspondence between the earlier findings and the present results suggests that the changes in factor patterns with age were attributable in considerable degree to the greater experience of the older subjects.

The findings indicate that the every-day experiences of living and education have effects upon the organization of human mental abilities which are strikingly similar to the effects often attributed to maturation. The findings raise but do not answer the question as to whether maturation in the absence of differential experience is a determinant of mental organization.

Microfilm copy of complete manuscript of 71 pages, \$1.00. Enlargements 6" x 8", 10¢ per page. Library of Congress card number MicA54-574.



# A QUANTITATIVE INVESTIGATION INTO THE NATURE OF IDENTIFICATION

(Publication No. 6959)

Lionel Mordecai Lazowick, Ph.D.  
University of Illinois, 1953

It is a generally accepted notion that men tend to be like their fathers and women like their mothers. This behavior is, at least in part, learned, and this type of learning is the social matrix from which the concept of identification was drawn. Descriptions of this term have been diverse and entirely qualitative in nature. As it stands today, the concept presents a confused and disordered picture.

A review of the various conceptions of identification is presented followed by a proposed revision. Identification is traditionally defined as the similarity between the behavior of a subject and his model; this the writer has called inferred identification. Since it was shown that much of this similarity of behavior between subject and model could not be convincingly accounted for in terms of learning, it was suggested that in identification meanings, rather than specific behavior patterns, are learned. Identification is then defined as the interpersonal similarity between the meaning systems of subject and model.

The following hypotheses were presented:

1. Normal subjects tend to identify more with the same-sexed parent than neurotic subjects.
2. Normal subjects will tend to identify more with both parents than neurotic subjects.
3. Normal male subjects will tend to identify more with their fathers than normal women tend to identify with their mothers.
4. There will be greater semantic similarity between the parents of normal subjects than between the parents of neurotic subjects.

Subjects consisted of 418 college students at the University of Illinois. On the basis of scores obtained on a revision of the Taylor Manifest Anxiety Scale subjects were divided into two groups. One group consisted of male and female subjects who received anxiety scores in the lowest ten percentile of their sex group (ML and WL) and the other group consisted of male and female subjects who received the highest ten percent of the scores for their respective sex groups (ML and WL). Any subject obtaining a lie score of greater than five was also eliminated. In all, 92 subjects remained. The Semantic Differential was administered to each of these subjects and to as many of their respective parents who filled out this test form and returned it.

The Semantic Differential was the instrument for measuring the similarity of meanings between children (subjects) and their parents (models). The test of Associative Contingency was also administered to the subjects as a measure of inferred identification.

The data support all four hypotheses in the case of male subjects and only the third in terms of female subjects. The data on inferred identification, however, did find some support from the female data on the first and second hypotheses.

Current opinion indicates that normal subjects tend to identify with the parent of the same sex, and

that neurotic subjects tend to show a confused and divided sexual identification. The findings of this study indicate that normal subjects identify with both parents and that neurotic subjects differ from normal subjects in that the degree of identification with both parents is less.

Microfilm copy of complete manuscript of 109 pages, \$1.36. Enlargements 6" x 8", 10¢ per page. Library of Congress card number MicA54-575.

# SENSORY PRE-CONDITIONING AND STIMULUS HABITUATION

(Publication No. 6963)

John Daniel Lyons, Ph.D.  
University of Illinois, 1953

Six groups of 15 rats each were given pre-training by exposing them to various combinations of two stimuli. The conditions for the six groups were (1) light and buzzer simultaneously, (2) onset of light preceding onset by buzzer by 0.7 seconds, (3) light and buzzer presented randomly in a non-paired fashion, (4) light only, (5) buzzer only, and (6) neither light nor buzzer (apparatus habituation). All animals were then trained to jump a barrier at the sound of a buzzer to avoid a shock. This was followed by similar training with the flashing light stimulus.

Animals which had been exposed to the buzzer in pre-training learned significantly slower in the buzzer-avoidance training than animals which had not previously heard the buzzer.

In light-avoidance training, the animals which had been exposed to the light without buzzer-pairing made significantly fewer conditioned responses during the first training session than did animals which had received the paired presentations or which had never been exposed to the light.

Animals which had been exposed to the light without pairing required a significantly greater number of trials to reach the learning criterion in light-avoidance training than did animals which had never seen the light. These animals also required more trials to reach the criterion than did the animals which had received paired presentations, though the difference was not highly significant.

No difference was found in light-avoidance training between animals which had had the light paired with the buzzer and animals which had never been exposed to the light.

No difference was found between animals which had received the light and buzzer simultaneously and those for whom the onset of the light preceded the onset of the buzzer.

The results of this experiment may be tentatively interpreted to indicate that some secondary stimulus generalization did occur as a result of pairing the two stimuli during pre-training, but the facilitating effect of this generalization was neutralized by the depressing effect of stimulus habituation.

Microfilm copy of complete manuscript of 47 pages, \$1.00. Enlargements 6" x 8", 10¢ per page. Library of Congress card number MicA54-576.

**VECTERING AIRCRAFT BY RADAR: THE EFFECT OF LOAD AND SPEED DIFFERENCES ON CONTROLLERS' PERFORMANCE IN A SIMULATED AIR TRAFFIC SITUATION**

(Publication No. 6966)

Beatrice Johnson Matheny, Ph.D.  
University of Illinois, 1953

The present study was designed to determine the effects of load or the number of aircraft pips under simultaneous control and the speed differences between pips upon radar vectoring performance in terminal area air traffic control. The experimental design was represented by a three by three factorial arrangement which tested loads of three, six, and eight aircraft pips and speed conditions of (1) 145 mph, (2) 130 mph, 145 mph, 160 mph, and (3) 120 mph, 130 mph, 145 mph, 160 mph, 175 mph, 190 mph. A simulated surveillance radar scope (scale .26 inches to one mile) and simulated aircraft were used. The vectoring pattern was a trombone shaped pattern. The radar controller was instructed to vector aircraft pips over the final gate every one and one-half minutes, to align them on the ILS, and to avoid collisions of the aircraft pips. Performance was measured by the constant error of the average intervals of aircraft passing over the final gate, within individual variability in achieving the intervals, between individual variability, missed approaches, and collisions.

The results indicated that both the load of pips and the speed differences between these pips affected the efficiency and safety with which the aircraft were vectored through the terminal area by the radar controllers. As the speed differences increased from the condition involving a zero difference to the condition with the greatest range of speeds, performance deteriorated. A similar decrement in performance was demonstrated as the load of aircraft pips was increased. Of the two variables, the effect of differences in aircraft speed was the greater. However, the data indicated that when all aircraft were "flying" at the same speed, an increase up to a load of eight aircraft had no significant effect upon performance under the conditions of this experiment. When aircraft were traveling at different speeds, an increase in load as well as an increase in speed differences resulted in quick deterioration of performance.

It was shown graphically that the size of the time intervals between aircraft passing over the final gate was a function of the size of the speed differential between the two aircraft composing each interval. As the size of the speed differential increased, the difference between the intervals achieved and the standard increased. When the first aircraft of an interval was followed by a slower aircraft, the interval was greater than the standard. When the first aircraft was followed by a faster aircraft, the interval was less than the standard. The variable of load showed a slight trend toward accentuating this function and increasing the displacement of the interval

from the standard for corresponding differentials in aircraft speed.

Results obtained from the participation of experienced radar controllers in some of the experimental conditions substantiated the experimental findings and demonstrated that the level of proficiency of the experienced controllers was approximately equal to that of the experimental subjects in this laboratory task.

Microfilm copy of complete manuscript of 107 pages, \$1.34. Enlargements 6" x 8", 10¢ per page. Library of Congress card number MicA54-577.

**PERCEPTUAL VARIABLES AS INFLUENCED BY MANIFEST AND THREAT-INDUCED ANXIETY**

(Publication No. 6970)

John Weldon Moffitt, Ph.D.  
University of Illinois, 1953

As a function essential to survival the process of perception is governed by the necessity of perceiving the environment in a manner which will best serve need-satisfaction. In meeting this requirement the organism seeks to achieve stability and definiteness in its perception of the environment. Ambiguity and instability of perception arouse anxiety. In this sense anxiety may be considered as a "signal flag" which appears when the organism is confronted with an uncertain or ambiguous situation which may or may not be threatening. From this we may deduce that increasing anxiety will be associated with greater necessity for achieving the goals of perceptual stability and clarity, and for maintaining them, even in the face of possible contradictory information. In order to test this general hypothesis we have made five specific predictions as to the perceptual behavior of individuals characterized by high anxiety.

1. They will seek to achieve a more stable background and therefore will perceive a greater alteration of objects in a room of similar construction to the Ames room.
2. They will form more perceptual closure with very brief stimulus exposure.
3. They will tend to fixate an incorrect closure longer in spite of contradictory information, and therefore will be less likely to achieve a correct articulation that requires overcoming contradictory information.
4. They will be more "rigid" in their perception and will be less willing to change their perception with changing sensory information.
5. They will be more affected in their perception by contrasts in brightness.

The Grice Revision of the Taylor Scale of Manifest Anxiety was administered to a large group of students. From this group forty students characterized by high manifest anxiety and forty characterized by low manifest anxiety were selected for the experiment. Half of the subjects for both degrees of



manifest anxiety were assigned to the two task conditions designed to produce high and low situational anxiety by means of threatening instructions. All subjects were then given perceptual tests designed to verify or refute the specific predictions.

The data for each test were submitted to an analysis of variance in order to provide statistical evidence relative to the predictions. The results of this analysis provide evidence for the following:

1. Poor articulation is influenced by the interaction of manifest anxiety and the threat produced by the instructions. Neither variable by itself produces a measurably significant influence.
2. No support is found for the prediction that brightness contrast effect is increased either by the manifest anxiety or by the threat of the instructions.
3. Significant evidence supports the prediction that brief-presentation closure is increased by the threat-induced anxiety but not by manifest anxiety.
4. Perceptual rigidity appears to be increased by threat, though again no significant measurable effect is found for the effect of manifest anxiety.
5. Strong evidence is obtained to support the hypothesis that the need for a stable background, as measured by the degree of illusion obtained in the distorted room, is increased by both manifest anxiety and threat-induced anxiety.

The results of the study lend themselves well to an homeostatic interpretation of behavior; within this framework anxiety may be considered as a kind of disequilibrium. The principle of homeostasis assumes the tendency of all perceptual processes to seek equilibrium. The process of achieving a stable and definite perceptual world is a most essential process in the maintenance of homeostasis with the external world and in the removal of anxiety. In this experiment the tendency of anxious subjects to be more rigid, to achieve greater closure and stability of perception very likely represents an effort on their part to relieve anxiety by dispelling perceptual ambiguity, for ambiguity serves to maintain anxiety whereas the achieving of a stable and definite world will reduce it.

Microfilm copy of complete manuscript of 149 pages, \$1.86. Enlargements 6" x 8", 10¢ per page. Library of Congress card number MicA54-578.

#### TRANSFER OF TRAINING AS A FUNCTION OF TASK COMPLEXITY

(Publication No. 6978)

Malcolm Luther Ritchie, Ph.D.  
University of Illinois, 1953

An experiment was performed to test the hypothesis that transfer of training is a consistent decreasing function of the complexity of the task. A series of tasks was employed using the same display panel

and response handle. Complexity of the task was varied by the utilization of from two to six of six stimulus lights and from two to six of six independent movements. Each task was then distinguished by the number of light-movement pairs. Complexity was expressible in terms of the number of alternatives available.

The hypothesis was supported by a consistent trend of transfer decreasing as complexity increased. The chance probability of obtaining this result is less than one percent.

A secondary hypothesis yielded inconclusive results.

Microfilm copy of complete manuscript of 81 pages, \$1.01. Enlargements 6" x 8", 10¢ per page. Library of Congress card number MicA54-579.

#### A STUDY OF THE EFFECTS OF SODIUM CHLORIDE AND HYDRATION ON A MONOSYNAPTIC REFLEX PATHWAY IN THE SPINAL CORD OF THE ALBINO RAT

(Publication No. 6998)

Matthew John Wayner, Jr., Ph.D.  
University of Illinois, 1953

Thirst induced by subcutaneous injection of sodium chloride was studied in the albino rat. Water intake increased and tended to reach an asymptotic value as the amount of sodium chloride injected was increased. Thirst, inferred from the amount of water ingested, which followed a subcutaneous injection of sodium chloride increased to a maximum in approximately thirty minutes. It was high throughout the first hour. It continually decreased after thirty minutes and reached a minimum value in two hours. The antidiuretic response to subcutaneous injection of sodium chloride increased as the amount of salt was increased. The effectiveness of an injection of sodium chloride to produce an antidiuretic effect decreased in time but was quite pronounced even for small amounts of salt at the end of two hours.

A study was made of monosynaptic reflex discharges recorded from the sixth lumbar ventral root to stimulation of the sciatic nerve and three of its branches. The rat displayed very little postsynaptic post-tetanic potentiation. The maximum facilitation, approximately 25%, occurred in response to a ten seconds tetanus of 400 cycles per second. There were no effects of a subcutaneous injection of sodium chloride on a monosynaptic reflex discharge. Hydration produced a decrease in the excitability of a monosynaptic reflex pathway in the spinal cord which was attributed to intact neural connections between the brain stem and higher nervous structures. The possibility that these structures are located in the hypothalamus was discussed.

Microfilm copy of complete manuscript of 101 pages, \$1.26. Enlargements 6" x 8", 10¢ per page. Library of Congress card number MicA54-580.

## RELIGION

### A CURRICULUM STRUCTURE FOR OLDER PERSONS IN THE CHURCH BASED UPON A STUDY OF THE OPINIONS OF MINISTERS AND OLDER PERSONS

(Publication No. 7096)

Charles Wesley Garrett, Ph.D.  
New York University, 1953

#### Problem

The problem of the study was to ascertain the attitude-opinions of older persons toward the church and the attitude-opinions of ministers toward older persons in order to provide a basis for planning the religious education of older persons.

#### Procedure

The procedure for identifying attitude-opinions involved two scales constructed according to the Thurstone method of equal-appearing intervals. Statements of attitude-opinions held by older persons were collected by interviewing older persons, by visiting an older persons' community center, by an older person informally questioning other older persons, by observations of participants of the First National Conference on Aging and of ministers residing beyond the delimited area of the study, and from pertinent literature. Thus 104 statements were gathered, were subsequently evaluated by fifty judges, and twenty final test items were selected according to scale and Q scores.

This scale was mailed to 2,000 representative older persons of eight counties of New York. Ninety per cent of these names were secured from Methodist Church constituency rolls; the remainder came from either county welfare records or non-Methodist Church constituency rolls. Of the 2,000 mailed tests, 429 useable ones were returned. Every tenth person of the 429 was interviewed.

The ministers' scale was developed by collecting 118 statements of attitude-opinions from members of the First National Conference on Aging, from ministers beyond the delimited area, and from pertinent literature. Twenty final test items were selected according to evaluations of fifty judges. This scale was mailed to 116 Methodist ministers of the eight counties with 90 useable tests being returned. Ten per cent random sampling interviews were conducted.

A theoretical curriculum outline was evolved from literature of religious and secular adult education, proceedings of later maturity conferences, and actual older persons' group activities. This outline was submitted to a jury of six educational authorities - three secular and three religious.

#### Findings

##### Attitude-opinions of Older Persons

The difference between the mean of mailed scales and the mean of interview tests was only .02. The findings based upon 429 useable returned tests disclosed that every population category sampled revealed through the mean of its scores a group tendency of favorableness toward the church. No significant differences between the sexes or among the population groups of rural, village, or city were found.

##### Attitude-opinions of Ministers

The difference between the mean of mailed tests and interview tests was .04. Of 90 useable tests the means of all three ministerial population categories (rural, village, and city) demonstrated that ministers of this study have a favorable attitude of older persons. No significant differences were found among the ministers of the three population categories. The most unfavorable item of the scale disclosed that apparently rural ministers have the greatest feeling that in certain cases older persons thwart religious progress.

##### Curriculum

All six jury members were in agreement as to the five major curriculum areas: study, service recreation, worship, and evangelism.

#### Conclusion

The results of older persons' scale stressed "worship" as the predominant curriculum category. "Service" and "evangelism" were of secondary importance with "recreation" and "study" being of subsidiary status to the latter two. The interviews of older persons supported the findings of the attitude-opinion scale. The findings of the ministers' scale showed the "service" was considered most important. However, ministers in the interviews equated "service" and "worship" as important emphases in curriculum. Thus "worship" and "service" appear as the most important emphases in curriculum. "Study," "recreation," and "evangelism" fall into subsidiary roles. Older persons do not desire the creation of special groups designated as segregated group satisfiers of older persons' needs. Instead older persons want to become integrated in the normal groups of church family life.

Microfilm copy of complete manuscript of 225 pages, \$2.81. Enlargements 6" x 8", 10¢ per page. Library of Congress card number MicA54-581.



## SOCIAL PSYCHOLOGY

### ACTION THEORIES IN HUMAN RELATIONS: AN INVESTIGATION OF SELECTED ACTION THEORIES AND REPORTED CASES DESCRIBING CHANGE IN UNDEMOCRATIC ATTITUDE AND BEHAVIOR

(Publication No. 7093)

John Joseph Donovan, Ph.D.  
New York University, 1953

This dissertation deals with an investigation into that phase of human relations concerned with theory as functioning in the resolution of a human relations problem, be it between one individual and another, an individual and a group, one group and another.

From a review of the literature, four action theories were selected to test as to their functioning in twenty cases where action had terminated in social change.

The theories selected are (1) the Knowledge-Action Theory which holds that knowledge of the facts, or information, is the central, if not exclusive, factor in the reduction or elimination of human relations problems; (2) the Economic Factor Theory which holds that human relations problems are basically economic problems, and the most important factor in resolving these problems is the satisfying of underlying economic needs or difficulties; (3) the Personal Interaction Theory which involves factual knowledge plus the psychological factor of participation, involvement, or interaction of the disputants; (4) the Guided Group Evaluation Theory which stipulates factual knowledge and the psychological factor of belongingness.

The hypothesis underlying the investigation is that it is rare that the successful resolution of a human relations problem results exclusively from the functioning of any single action theory.

The selection of the twenty cases resulted from an examination of a great number of cases of human relations problems found in the files of social agencies and reputable journals. The cases had to meet the following criteria: (1) they must have been free from psychiatric implications; (2) from obvious economic difficulties; (3) from politico-legal influences; (4) and they must have been closed at the time of examination.

These twenty cases were examined by the investigator. His conclusions as to which theory or theories functioned in each case were checked by three co-investigators all of whom had received the Master's degree either in sociology or in psychology and had indicated continued interest in these fields by pursuing graduate studies therein. The conclusions of these four investigators were substantiated by appropriate excerpts from the original reports. The data were tabulated and incorporated into three tables showing what theories were judged by each of the four investigators to be present in each of the

twenty cases, also what each investigator judged to be the most important theory functioning in each of the cases, and what theories were judged by each of the four investigators to be present in the cases grouped according to type of human relations problem.

The investigation disclosed that not in one single case of the entire twenty did the resolution come as a result of the functioning of but one single theory. In every case, the four investigators were unanimous in declaring that certainly two, and in some cases three and even four of the theories applied. Thus, the hypothesis of the investigation tended to be validated. It was found, moreover, that despite the type of human relations problem, generally speaking, the Knowledge-Action Theory and the Economic Factor Theory seemed to predominate.

Microfilm copy of complete manuscript of 189 pages, \$2.36. Enlargements 6" x 8", 10¢ per page. Library of Congress card number MicA54-582.

### THE CONTEXT OF ASSERTIONS AS A DETERMINANT OF ATTITUDINAL RESPONSES

(Publication No. 6899)

William Gordon Leary, Ph.D.  
Stanford University, 1953

This study explores the role of the context of assertions as a determinant of attitudinal responses.

The research findings and speculations of social psychologists, linguists, and semanticists illuminate the problem of the meanings of attitude objects, which are shown to be vague on at least three counts. They are very general and carry with them no specific context. They are cast in a linguistic structure calculated to invite a dichotomous response and to encourage reification of abstract terms. They are expressed in the language of opinion with no clearly discernible referents for the terms employed. Thus, because attitude objects are such high-level abstractions, interpreters of attitudinal responses cannot be sure of the meanings which respondents attach to these objects. Likewise, the interpreter cannot safely infer that attitudinal responses to general concepts will extend to specific instances.

Faced with these difficulties, some investigators have limited their purpose to that of determining the subject's publicly verbalized opinions about symbolized abstractions. Others have abandoned the method of quantification in order to obtain "the concrete content of a person's thought." Both alternatives are unsatisfactory: the one stops short of the assigned task of psychology, the other abandons the relatively greater degree of objectivity and the safer base for prediction which the quantitative method affords. Needed are controlled observations

of reactions to factual particulars that are compatible with the established views of some subjects and contradictory to those of others. This study seeks to supply this need.

Starting with the assumptions that the meanings of attitude objects are not constant and that these meanings shift with changes in context, this study tests the hypothesis that attitudinal responses to the highly generalized judgments comprising the psychological objects in conventional attitude scales can be modified measurably by the introduction of supplied contexts in the form of factual narrative anecdotes replete with particulars having a direct bearing on the issue in question. Two corollary hypotheses are likewise tested: (1) that supplied contexts favorable to an established view will encourage movement in the favorable direction along the scale; (2) that supplied contexts unfavorable to an established view will have the opposite effect. Differences of opinion concerning the efficacy of current educational theories and practices form the issue concerning which attitudes are measured. College upper-classmen and graduate students in Education form the experimental group. A screening device is used to insure subjects' firmly declared convictions about this issue. Subjects are first exposed to an attitude scale of the conventional Likert design. Two experimental groups are subsequently exposed to different scales incorporating supplied contexts favorable to pro-Educationist and pro-Academic viewpoints, respectively. A control group to check the effect of regression repeats the first scale.

Statistical analysis of the obtained data (analysis of variance and the deriving of critical ratios were the techniques used) yielded significant results which support the hypotheses. All groups of respondents moved in the predicted directions to a significant degree ( $P$ 's = .001) except those scoring in the "middle third" on the initial scale. Reliability estimates for the several instruments range from .67 to .80.

Findings suggest the need for attitude scales of greater specificity of content if they are to serve as useful predictors of social behavior. Findings also reveal the workings of cognition operating to modify a previously held attitude in the light of new information, supporting those social psychologists who decry the emphasis in research on the emotional components of attitudes. Finally, the evidence that persons confronted with concrete particulars do not react in the same way as they do to vague generalizations may have important practical significance to those charged with the responsibility of achieving consensus about issues in dispute.

Microfilm copy of complete manuscript of 121 pages, \$1.51. Enlargements 6" x 8", 10¢ per page. Library of Congress card number MicA54-583.

# INVOLVEMENT AS A BASIS FOR STRESS ANALYSIS: A STUDY OF HIGH SCHOOL TEACHERS

(Publication No. 6860)

Chandler Washburne, Ph.D.  
Michigan State College, 1953

The primary purposes of this study were to develop a theoretical scheme suitable for the study of stress in occupational life, second, to discover possible hypotheses in this area, and third, to reveal some substantive findings about the nature of the occupational life of teachers (from the viewpoint of stress).

The theoretical approach was to treat stress as an intervening variable when an individual is blocked from reaching an important goal. The goals which are dealt with here are common culturally given ones which actors come to accept. These goals can be blocked in a variety of ways especially when contradictory goals are held by an individual. This is a very likely possibility when a variety of social structures are attempting to control the goals and actions of teachers. This produces a conflict of "legitimate orders" which can lead to structural or stressful personality conflicts. The psychological literature indicates that the most difficult problems for individuals arise when the blockage stems from internal conflicts. The position of teacher tends to be unclearly and ambiguously determined.

As the study was exploratory a depth interview method was used upon a restricted sample. A method of analysis was devised which was neither statistical in the sense of predicting probable percentages, of certain indices in a universe on the basis of a sample from it - nor was it at the other extreme an analysis of a series of cases in all their individual uniqueness. Rather it was concerned with the development of types of involvement useful in stress analysis.

The substantive aspect of the study was concerned with the operation of actual stress factors in the occupational position. The use of the method, as it was developed, uncovered data about the nature of stress in the position, at the same time that the method was being more fully conceptualized.

Previous research had revealed the difficulty of using a methodological approach which viewed stress as inherent in the station (position), or on the other hand, as directly and simply measured in a specific type of response made by actors. Thus, a method based on the relationship between the actor and station was developed, and conceptualized as involvement.

The actor's involvement with the station was found not to be unidimensional, and therefore a typology of kinds of involvement was developed. Each type would vary independently in degree. It was premised that the most highly involved areas would be the ones where the important stresses would arise, through the operation of factors which blocked the actor in these areas.

In the substantive findings four such uni-dimensional



areas were developed. These areas were isolated on the basis of their importance in the station of high school teacher, and because they would be relevant to a wide range of occupational stations. The four areas were: Economic and Security, Status, Authority and Profession.

A variety of simple indices for each areas were developed indicating kind and degree of involvement. This allowed a ranking of cases in the areas. Various stress experiences were related to these indices. The pattern of involvement appeared to be predictive of the area in which stress would occur and predicted something of the response that would be made to it.

In conclusion, the involvement method of stress analysis seems to be justified and worth further exploration, on the basis of the fruitfulness of its application in this study. Secondly, the station of high school teacher is characterized by a number of basic dilemmas and contradictions, which makes clearcut and unstressful role performance difficult for teachers with a wide variety of different kinds and degrees of involvement.

Microfilm copy of complete manuscript of 284 pages, \$3.55. Enlargements 6" x 8", 10¢ per page. Library of Congress card number MicA54-584.

## SOCIOLOGY

### SOCIOLOGY, GENERAL

#### AN ANALYSIS OF THE SOCIAL POWER POSITION OF THE REAL ESTATE BOARD IN GRAND RAPIDS, MICHIGAN

(Publication No. 6849)

Donald Herbert Bouma, Ph.D.  
Michigan State College, 1952

This study is concerned with analyzing the social power position of the Real Estate Board in Grand Rapids, Michigan. Social power is considered as the combination of influence and authority within a social system for making, legitimizing, and executing decisions. The primary focus is the Board as a system of influence which has played a large part in the shaping of community-wide decisions. The problem was to ascertain the bases for the power position, or the social capital resources of the Board which permitted it to exercise its social power so effectively that it has never lost a decision in the arena of public elections, regardless of the alignment of opposing power blocs.

Of concern, also, were the legitimizing efforts of the Board whereby its participation in the making of decisions was validated, and the limitations which circumscribed the power position.

The problem was approached in three ways. The official minutes and records of the Real Estate Board were scrutinized to determine the kinds of community decisions in which it was interested and the techniques employed to influence the making of decisions, both in the arena of public elections and that of authority. Individual realtors and those persons holding leadership positions in the community were interviewed to determine the Board image and the community image of the power position. The alignment of power blocs on a number of controversial issues was determined by newspaper analysis as well as through the participant-observer technique.

The factors which were found to be basically involved in the social power position of the Board in-

cluded the following items: the social cohesion of the group and its mechanisms of social control over the membership; the multiple-listing system which provided the Board with a mode of operation enabling it to make immediate decisions on issues that arose and to immediately implement them; the cumulative nature of social power; the social capital available to the group because of the technical information it possessed; the awareness of, sensitivity toward, and identification with the value systems of the community; direct participation of Board members in authority positions; the techniques for handling opposing power blocs; the effective manipulation of symbols; and the adequacy of the legitimization processes.

Other findings of the study were: Social power as exercised by the group of influence was negatively evaluated in the community, and this was an area of vulnerability for the power group. Prestige and influence operated as independent variables. To the extent that the power group was successful in influencing decisions in the arena of public elections, its ability to influence decisions in the arena of authority was strengthened. There was stimulative interaction between the ability to influence decisions and recognized success in this process; i.e., social power tended to be cumulative. To the extent that the group was successful in influencing decisions, its advice was sought on certain issues by those interested in social action; and the power position was thus reinforced.

Microfilm copy of complete manuscript of 322 pages, \$4.03. Enlargements 6" x 8", 10¢ per page. Library of Congress card number MicA54-585.

## SOCIOLOGY, PUBLIC WELFARE

LEGAL RESPONSIBILITY OF PARENTS  
FOR JUVENILE DELINQUENCY IN  
NEW YORK STATE

(Publication No. 7097)

Irving Arthur Gladstone, Ph.D.  
New York University, 1953

The law of New York State providing that parental contribution to delinquency of children is punishable as a misdemeanor becomes significant particularly as the enforcement of this law has promise of curbing or preventing such delinquency. It was the alleged success of the "Adult Delinquent Law" adapted by Colorado in 1903 that induced the New York Legislature with the enthusiastic endorsement of authorities in child welfare to enact a substantially similar statute in 1905. The historical development of the adult contributory law (Penal Law Section 494) is traced through its failure in the jurisdictions of both the criminal and children's courts of this State to accomplish the purpose for which it was designed.

In 1947 the case of *Humann v. Rivera*, cause celebre in the campaign of the New York City Police Department to enforce the revived adult contributory law, drew sharp protests from leaders in social welfare. A study of this case provides a basis for better understanding of the operation of the law and highlights the difficulty experienced by the Children's Court of New York City in performing functions for which it is not equipped.

A poll conducted in 1952 by the investigator elicited opinions from commissioners of public welfare, directors of social agencies, district attorneys, editors of newspapers, judges of children's courts, psychiatrists and superintendents of schools concerning enforcement of the adult contributory law. In general, about one third categorically opposed enforcement; and about one third notably qualified their endorsement by conceding that legal proof required to establish that a parent has contributed to delinquency makes the statute unenforceable for all practical purposes.

Individual letters revealed a need for a "Sic et Non" which was supplied by seven antithetical arguments gleaned by the investigator from the reasons offered by the correspondents.

Failure of numerous polled authorities to distinguish significant types of parental conduct allegedly constituting a basis for punishment under Penal Law Section 494 motivated the investigator to classify such conduct in four categories and analyze each category regarding the frequency of its cases; the extent to which such cases are covered by the statute; the possibility of preventing juvenile delinquency by reason of such coverage.

The "Anti Vandalism Bill," unsuccessfully proposed for New York City in 1952, is in fact a limited adult contributory law. Especially significant, therefore, is the openly stated opposition to this bill by fourteen of the eighteen Justices of the Domestic Relations Court of New York City for substantially

the same reasons as those presented by polled authorities who categorically opposed enforcement of Penal Law Section 494.

Cases decided in this State indicate a conflict of law involving constitutional issues regarding the jurisdiction of the children's courts with respect to criminal prosecutions under Penal Law Section 494. Fundamental is the difficulty of reconciling the modern therapeutic approach of the children's court with the traditional punitive operation of the criminal court.

Moreover, the Legislature is challenged by specific questions of public policy gravely affecting the problem of juvenile delinquency, the operation of the children's court and the equitable treatment of parents prosecuted under the adult contributory law.

It is recommended that Penal Law Section 494 be amended to include only acts of commission contributing to juvenile delinquency; that judges of the children's court be authorized to screen cases for prosecution under this section in the criminal courts; that jurisdiction of such cases be limited to criminal courts where no case may be tried by the same judge who conducted the proceedings involving the delinquent child.

Microfilm copy of complete manuscript of 202 pages, \$2.53. Enlargements 6" x 8", 10¢ per page. Library of Congress card number MicA54-586.

## SOCIOLOGY, RACE QUESTION

THE EMOTIONAL PROBLEMS OF NEGRO  
HIGH SCHOOL YOUTH WHICH ARE RELATED  
TO SEGREGATION AND DISCRIMINATION IN  
A SOUTHERN URBAN COMMUNITY

(Publication No. 7101)

Baker Michael Hindman, Ph.D.  
New York University, 1953

The purpose of the study was to investigate the relationship between experiences, involving interracial contacts, and the attitudes and feelings of a group of Negro high school youth in a southern urban community. It undertook to explore several dimensions of the emotional reactions of these youth to segregation and discrimination. It seemed that a more accurate knowledge of these relationships would contribute to a program of guidance for Negro high school youth, especially in those sections where racial segregation is now practiced but which may, in the future, move toward integration.

The subjects for the study were the eleventh grade students in the Negro high schools of Dade County (Miami), Florida. An open-end questionnaire was used as the data-gathering instrument. In this questionnaire, the subjects were asked to respond anonymously to several questions regarding their experiences involving contact with white



persons. Their replies were then categorized, and statistically analyzed.

In the first part of the questionnaire, before any mention had been made to the subjects of inter-racial relations, they were asked to list three changes which they would make in ways of living in the Miami area if they had the power to do so. The replies indicated that the concern of the youth was concentrated in the areas of education, recreation, and housing, and that the overwhelming majority considered segregation a major problem.

They were then asked to answer a group of questions regarding both their pleasant and their unpleasant inter-racial contacts. It was found that such contacts were concentrated in a relatively small number of areas of life. It was significant that their pleasant inter-racial experiences occurred, for the most part, in the same areas as their unpleasant ones.

The type of unpleasant incident most frequently reported by the youth was overt verbal rudeness. An analysis of the subjects' descriptions of their impulses to react to discrimination indicated that a considerable amount of their hostility and resentment is centered upon incidents of this type which include, according to the subjects' accounts, a considerable amount of name-calling, and especially of the use of the epithet, "nigger."

The most common impulse to react to discrimination, as reported by the youth, is to fight. Very few, however, report having given expression to this impulse. The most common overt response was to ignore the situation. There is some evidence, though not conclusive, that the technique of ignoring dis-

crimination may be, for some, a satisfying, yet relatively "safe" means of giving vent to their aggressive feelings.

There was little agreement among the youth as to the underlying causes for discrimination. This suggests that Negro youth do not understand the dynamic causes for segregation and discrimination.

The findings of the study may provide useful information for those charged with the guidance of Negro youth. The lack of understanding of causes, the fact that pleasant experiences were encountered in all the areas of life in which unpleasant incidents occurred, and the various ways in which the youth report having overtly responded to discrimination, all provide points of attack in such a guidance program.

Although the unpleasant incidents are not concentrated in a relatively small number of areas, it is reasonable to expect that, as a section abolishes segregation, they may also be anticipated in other areas. Because of this, and also because of the clues as to the areas of life which are already points of tension, community leaders and educators may discover, in the findings of the study, some suggestions for relieving tensions and avoiding serious conflict.

These represent only a few of the many implications of the data of the investigation.

Microfilm copy of complete manuscript of 178 pages, \$2.23. Enlargements 6" x 8", 10¢ per page. Library of Congress card number MicA54-587.

## SPEECH - THEATER

### SPEECH, THEATER

#### SAMUEL PHELPS AND HIS MANAGEMENT OF SADLER'S WELLS THEATRE

(Publication No. 7151)

Shirley Seifried Allen, Ph.D.  
Bryn Mawr College, 1949

This dissertation is a study of the place of Samuel Phelps in the history of English drama. It undertakes to show that he both made a more significant contribution to the development of the English theatre than has been recognized and also provided a model worthy of emulation by those who are now engaged in efforts to establish a national repertory theatre.

Phelps was the last of a dynasty of actors who ruled the English stage from Shakespeare's time to the end of his own life. Because Phelps came at the end of a long tradition, at a time when the creative spirit of English dramatists was at a low ebb, and only a few decades before the birth of a new English

theatre, his work fell into obscurity almost immediately after his death. Now that two generations have passed since the "modern" movement of acting replaced the school of which Phelps was the last representative, it is possible to consider fairly, from an adequate perspective, the admirable qualities which Phelps inherited from the traditional style of acting, the traditional methods of theatrical management, and the traditional repertory, and to recognize the extraordinary skill with which he adapted these to the new popular audiences of Victorian England.

Phelps's early career reveals the laborious training of an actor under the old system of provincial stock companies, financially unrewarding but rich in experience of so wide a variety of roles that it gave a versatility in impersonation and an acquaintance with traditional technique hardly to be learned in any other school. Success in London, promised by a well received debut at the Haymarket in 1837, was limited by Phelps's situation as simultaneously protegee and rival of Macready, until repeal of the theatrical monopoly by act of Parliament on

August 22, 1843 provided him with an opportunity he was not slow to seize.

In May, 1844 Phelps gathered a company of Shakespearean actors and leased Sadler's Wells Theatre with the intention of introducing legitimate drama for the first time to a suburban audience. The experiment, considered hopeless by most contemporary critics, was successful and lasted through eighteen years during a period which saw the failure of nearly every other theatrical venture in London. This success may be attributed to the principles upon which Phelps based his management. These principles, whose application is fully discussed in the dissertation were as follows:

1. Low prices of admission.
2. Strict adherence to the repertory system. He produced twenty to thirty different plays a season.
3. Selection of his repertory from the best works of English drama. Phelps disagreed with the contemporary assumption that a popular audience could not appreciate poetic drama. He devoted nearly half his performances to Shakespeare, producing thirty-one of the thirty-six plays, some of them not seen on the stage since the Restoration. His repertory also included ten other Elizabethan plays, twenty-four eighteenth century plays, and thirty-two nineteenth century plays, of which twelve were produced for the first time.
4. Development of a well trained repertory company. Phelps avoided the "star" system, insisted upon daily rehearsals, and aimed at a total effect in which every role, no matter how minor, received due emphasis.
5. Careful attention to stage setting. Without allowing his settings either to overwhelm the performers or exceed reasonable cost, Phelps indulged the nineteenth century taste for lavish realism.

The dissertation follows the course of Phelps's management at Sadler's Wells, describing in some detail the more important productions, with special attention to the restoration of original Shakespearean texts. It concludes with an appraisal of Phelps's ability as an actor and a brief account of his later years.

Microfilm copy of complete manuscript of 208 pages, \$2.60. Enlargements 6" x 8", 10¢ per page. Library of Congress card number MicA54-588.

#### AN EXPERIMENTAL STUDY OF THE RELATIVE EFFECTIVENESS OF SELECTED MEANS OF HANDLING EVIDENCE IN SPEECHES OF ADVOCACY

(Publication No. 7021)

Robert Stephen Cathcart, Ph.D.  
Northwestern University, 1953

It was the purpose of this study to investigate, by scientific methods, the part which various means of handling evidence play in the effectiveness of speeches of advocacy. The study was undertaken because:

- (1) rhetoricians, although upholding the value of sound evidence as a basis for rhetorical proof, have often disagreed over what are the most effective means of utilizing evidence in public speeches, and
- (2) there has been no previous experimental research concerned with evidence, *per se*. The object of the study was to determine the relative effectiveness of selected means of handling evidence in a speech of advocacy, as measured by the Woodward Shift-of-Opinion Ballot and a general speech rating scale.

To accomplish the objective of the study, four speeches advocating the abolishment of Capital Punishment were developed, each varying from the other only in matters of evidence and its utilization. The four speeches were varied as follows: Speech A contained no specific evidence (facts or opinions) in support of the speaker's contentions; Speech B made full use of evidence in supporting ninety per cent or more of the speaker's statements; Speech C was identical with Speech B except that the sources of all evidence used were cited and documented; Speech D, in addition to utilizing evidence and citing the sources of the evidence, qualified or established the "authority" of the sources utilized. Each speech was then recorded in the same manner, delivered by the same person, and under controlled conditions. After the four speeches had been judged by a panel of experts to have been constant in all matters except evidence, each speech was presented to an audience made up of selected high school and college students. In response to each speech, the listeners marked a Woodward Ballot, a general speech rating scale, and a background questionnaire. The data from these forms were then compiled, analyzed statistically, and interpreted.

The following results were obtained:

1. Speech A produced a favorable shift of opinion in terms of the Woodward Ballot, but this response was significantly less than the responses produced by Speeches B and D. Speech C produced a more favorable shift of opinion than did Speech A and a less favorable shift than did Speeches B and D; however, none of these differences was statistically significant. Speeches B and D produced identical mean shifts of opinion.

2. Each speech produced an almost equal number of favorable and unfavorable shifts of opinion; however, the two most effective speeches (B and D) produced a greater degree of shift in each case, and this greater degree of shift stemmed primarily from those who were originally opposed to the proposal.

3. In terms of the speech rating scale, there was no difference statistically in the rating each audience gave to the factors of "delivery," "liveliness," "clarity of ideas," and "speaker's competence"; however, Speech A was rated significantly lower on "evidence" and "argument" than were the other three speeches.

4. The above results were not affected apparently by such factors as whether or not the listeners had recently read or heard about the subject, or by how much speech training they had had, or by how much they knew about "evidence."



In conclusion, it can be said that:

1. A speech of advocacy will be more effective if supported with sound evidence than it will if not supported with evidence, other factors being equal.
2. Apparently, it does not increase the effectiveness of a speech, when it is supported with sound evidence, to cite the sources of the evidence and to qualify them.
3. Qualifying or "building-up" the sources of evidence makes a speech more effective than does a simple citation of the sources, but this does not make the speech any more effective than does a straight-forward presentation of the evidence alone.

Microfilm copy of complete manuscript of 214 pages, \$2.68. Enlargements 6" x 8", 10¢ per page. Library of Congress card number MicA54-589.

#### AN AUDIOMETRIC STUDY OF OTOSCLEROSIS WITH EMPHASIS ON EVIDENCES OF SENSORY-NEURAL CHANGE

(Publication No. 7022)

Frederick Martin Chreist, Ph.D.  
Northwestern University, 1953

The present investigation was undertaken to obtain information on the audiometric changes in air and bone conduction thresholds of patients having received the fenestration operation for clinical otosclerosis. The operation had been performed on one ear, the other ear was surgically untreated during the time of the study. The measurements used in the study were selected from the otosclerosis file of a group of otologists who cooperated in the investigation. These data consisted of pre- and post-fenestration audiograms containing air and bone conduction threshold records. Comparisons were made of these thresholds taken at three periods; before, shortly after, and four or more years following the operation. One of the purposes of the investigation was to search for evidence of sensory neural degeneration associated with clinical otosclerosis.

Analysis of the information obtained was conducted on several bases. The total population was studied, as well as various subgroups. Year of retest following the operation, surgeon's classification, and immediate postoperative comparisons were made to establish significant differences in the operated and unoperated ears immediately after the operation and at periods four years or more later. Conclusions stated are based on comparisons of seven frequencies in air conduction and of five frequencies in bone conduction, as well as the average for the speech frequencies.

Results of the comparisons made demonstrate that, on the average, the fenestrated ear retained the major part of the improvement in air conduction obtained as a result of the fenestration operation. The threshold levels of the unoperated ear in the speech frequencies, and at each frequency studied,

a small increased loss of acuity at all retest periods.

Bone conduction thresholds obtained gave evidence of improved hearing in both ears after the fenestration operation. Need for further investigation of the improvement in the unoperated ear was evident. When differences between the operated and unoperated ears were studied at various periods, a regular pattern appeared. This pattern of differences resembled the size and shape of the Carhart Notch, described previously by other investigators.

The results indicated little or no evidence of increased sensory neural degeneration during the period of study. No progressive drop in bone conduction thresholds and no significant high frequency decline in the air conduction curve were evident in the data studied. Changes were noted in the bone conduction curves when immediate postoperative measurements were compared with thresholds obtained four or more years later.

Comparisons were made between groups based on the surgeon's prognostic classifications. As would be expected, the pre- and postoperative air conduction thresholds of these three groups varied according to the classification. The "ideal" cases obtained the greatest gain, the "suitable" group the next, and the "limited and guarded prognosis" cases the least amount of improvement. Comparison of bone conduction thresholds for this group revealed that during the period of study the cases did not change classification from ideal to suitable, or from suitable to limited.

One of the incidental findings of the study was the consistent appearance of a bow shaped configuration of the preoperative air conduction curve. The contour of this curve appeared to be significant for indicating features of stapes fixation in clinical otosclerosis.

Final evaluation of the results can be made when the same kind of study has been carried out on a group of individuals having clinical otosclerosis on whom the fenestration operation had not been performed. Such a study might give more definitive evidence of sensory neural degeneration accompanying the encroachment of the disease.

Microfilm copy of complete manuscript of 166 pages, \$2.08. Enlargements 6" x 8", 10¢ per page. Library of Congress card number MicA54-590.

#### AN ANALYTICAL AND HISTORICAL INVESTIGATION OF THE STAGING OF RESTORATION COMEDY AS RELATED TO MODERN REVIVALS

(Publication No. 7029)

Gregory Alexander Falls, Ph.D.  
Northwestern University, 1953

Restoration comedies are seldom produced in this country, although they are recognized as having a certain literary and historical value. It is the

purpose of this paper to encourage modern revivals by attempting to discover means of producing them successfully. Two courses of investigation are followed: (1) a study is made of Seventeenth Century methods of production, since they were usually successful, and (2) an analysis is made of the nature of Restoration comedy to help orient modern revivals to the playwright's intent.

Chapter I tries to bring together all the known facts about the physical structure of Restoration playhouses, in order to determine the environment for which the comedies were written, and in which they were first produced. The essential characteristics of the playhouses were: (1) the audience was seated on four levels and was always in front of the actors, (2) the stage was divided into two main areas, one above the proscenium, and one below the proscenium, (3) the proscenium was equipped with at least two doors one on each side, and (4) the scenery was composed of wings, relieves, and shutters, which were capable of being rapidly shifted.

Chapter II deals with the actual use made of the physical playhouse. Some of the more important facts discovered were: (1) rather definite conventions governed the use of the proscenium doors; (2) although the actors played primarily on the apron, they also used the up-stage areas more than has been commonly supposed; (3) at least eight methods of changing settings were used; (4) frequent use was made of the doors, balconies, windows, and traps on the stage.

Chapter III is concerned with the elements of Seventeenth Century productions that were extraneous to the plays. These elements included music, songs, dances, prologues and epilogues. Music, songs, and dances were used before the play, during the intermissions, and as part of the play. Prologues always preceded the plays, while epilogues always concluded them. Diverse attempts were made to stage the prologues and epilogues in novel ways.

Chapter IV discusses the acting and stage business used in Seventeenth Century productions. The acting style seems to have been lively, broad, and even farcical, with a marked distinction being made between the young characters and the old. Much of the characterization seems to have been done according to stock types. The stage business in the original productions was usually active, and graceful, though some of it was broadly farcical. There was much activity around the doors and balconies, and groups of actors were often moving up and down stage as well as across.

Chapter V offers three general principles for staging revivals. First, revivals should try to reflect the Seventeenth Century's attitude of production. This attitude of production was one of "full-entertainment," which means that the playhouses gave the audience much music and many songs, dances, elaborate costumes, scenic effects, and clever prologues and epilogues all in addition to the play.

Second, directors and actors of revivals should be aware of the two bases of comedy in most of these plays. Usually the plot of a Restoration comedy is based on a chase-game, or battle of the sexes. Defi-

nite rules of conduct and attitude govern these chase-games, and these rules should be observed in modern productions. The second basis of comedy is the seriousness of the playwright in satirizing vice and folly. Inevitably the playwrights comically punish the foolish and the wicked. Once the satire is understood, it can help orient a modern production to the aims of the playwright.

Third, a number of specific suggestions are offered relative to stage business, scenery, costumes, make-up, and lighting.

Microfilm copy of complete manuscript of 273 pages, \$3.41. Enlargements 6" x 8", 10¢ per page. Library of Congress card number MicA54-591.

# AN AUDIOLOGICAL AND OTOLOGICAL INVESTIGATION OF NORMAL HEARING INDIVIDUALS WITH A FAMILY HISTORY OF CLINICAL OTOSCLEROSIS

(Publication No. 7035)

Albert Bruce Graham, Ph.D.  
Northwestern University, 1953

Supervisor: John H. Gaeth

Although otosclerosis has been discussed extensively in the literature, little has been written on the early stages of the disease process. This study was designed to investigate the earliest effects of the otosclerotic lesion by testing a group of individuals in whom the probability of the existence of otosclerosis was greater than average.

The procedures included completion of a case history questionnaire, administration of an otological examination, including selected tuning fork tests, and pure tone audiometric tests by both air conduction and bone conduction. The otological examination and questionnaire were utilized to eliminate the presence of any other ear pathologies and to search for those factors which have been reported as being frequently associated with otosclerosis. The audiometric tests were designed to investigate the possible existence of minor shifts from the normal in auditory acuity. The validity of the audiometric test results was established by careful calibration of the clinical audiometer prior to the testing period on a normal hearing population and by daily measurements through the use of artificial ear and mastoid units to check the relative constancy of acoustic output for both air conduction and bone conduction circuits.

Because otosclerosis has been reported to have a strong familial tendency, the experimental population was selected from the blood relatives of individuals known to have clinical otosclerosis without the complication of any secondary nerve degeneration. The 100 subjects selected for the experimental group were all within the age limits of nine through forty years, possessed no noticeable hearing loss, and had no other ear pathology. The data accumulated were compared to a small normal hearing control population, to a cleft palate group with varying degrees of



otitis media, and to a large normal hearing group from the National Health Survey. Analyses through standard statistical procedures provided the basic evidence from which the conclusions were drawn.

The main findings of the study are as follows;

1. None of the factors frequently associated with otosclerosis, except possibly tinnitus, was reported to any marked degree. A history of decay of deciduous teeth, bone fractures, and the presence of blue scleras were noted among the members of the experimental population, but not with a frequency which possessed statistical significance.
2. The air conduction contour exhibited by the experimental population possessed a significantly positive, or rising, slope from the point of greatest depression at 125 c.p.s. up to the least reduction in acuity at 2000 c.p.s. In the higher frequencies above this point there was a slight depression evident at 4000 c.p.s. with a minor rise again at 8000 c.p.s.
3. The bone conduction pattern possessed a slightly trough-shaped contour with the point of greatest depression at 2000 c.p.s. This was also a significant deviation from the zero reference line.
4. The resulting air-bone relationship revealed a small conductive type hearing impairment, most evident at the lowest frequency, with a gradual diminution in the hearing loss up to 2000 c.p.s.
5. None of the configurations described above was evident in the small control population, in the cleft palate population with another type of conductive impairment of hearing, or in a large normal hearing group from the National Health Survey.

Microfilm copy of complete manuscript of 148 pages, \$1.85. Enlargements 6" x 8", 10¢ per page. Library of Congress card number MicA54-592.

#### A THEORY OF HUMOR FOR PUBLIC ADDRESS

(Publication No. 6948)

Wilma Horrell Grimes, Ph.D.  
University of Illinois, 1953

The nature and use of humor in public address deserve rigorous scrutiny. This thesis endeavors (1) to examine historically and critically what the chief rhetoricians and authorities in related fields have said about humor, (2) to present a theory of humor which leaves out no essential contribution to the subject, and (3) to suggest some implications of the theory for the public speaker who employs such forms of humor as the pun, the anecdote, and the brief witticism.

The first main division of the thesis summarizes chronologically what the major rhetoricians

have written about humor. Almost all rhetoricians commented on the worth and function of laughter, and the literature contains speculations as to the cause of laughter, its physical appearance, and its emotional character. While contributing valuable insights on the objective stimuli to laughter, the rhetoricians said little about probable attitudes and internal states likely to affect the humorous experience of the listener.

The second major division of the thesis draws upon the contributions of non-rhetoricians, philosophers, aestheticians and social psychologists. Some of the recent experimental literature proved illuminating. It helped to establish the conviction that if one is to surmount the chaotic vocabulary which envelops humor, he will attempt a systematic view of humor as a stimulus-response pattern having a distinctive character. The psychologists also afforded some insight into the internal stimuli involved in the pattern. Those who try to isolate the response of humor behavior agree that laughter, or mirth, is a period of relaxation following a peak of tension. These responses have been culturally regulated and have social, as well as physiological, utility.

The third section synthesizes the elements of humor under the heading of "The Mirth Experience." The salient feature of the humorous experience appears to be incongruity, which results when a well-established movement takes a sudden turn in its course, and at the moment that the expected resolution should appear, a new and unexpected tendency sets in. Thus, the pattern of incongruity as a stimulus to mirth requires that tension, shock, resumption, and insight occur in rapid succession. Ordinarily internal forces do not inhibit mirth as a response to the perception of incongruity. The most favorable condition for humor is a state of objectivity, i.e., a state without specific motivation or preoccupation with such inhibiting factors as emotions of fear, love, and pity. Objectivity usually accompanies positive facilitators of mirth such as a pleasant mood, a feeling of expectancy, or sense of security. Probably a feeling of superiority prompted by the "defect" aspect of the stimulus facilitates mirth in many individuals. Since we learn what to laugh at, our learned attitudes and acquired knowledge function in humor, as in every stimulus-response pattern. The humorous experience, in brief, depends on the perception of an incongruous relation achieved by the juxtaposition of opposing statements in such a way that the tension induced by expectation is abruptly released and some form of mirth results.

The last division of the thesis tests the theory of humor thus derived in cases of verbal humor found in certain speeches of Mark Twain, Robert Ingersoll, and Adlai Stevenson. Each case reveals the pattern of incongruity in the pun, the witticism, and the anecdote. It seems clear that friendly "climate" facilitates mirth; yet witticisms and anecdotes cannot of themselves create a friendly climate. Many claims for the value of humor in public address are open to question; the speaker must look critically at the traditional rhetorical values of humor, deciding for each speech and for each instance of

humor whether it can be used to advantage. As yet, there is no evidence that speeches containing humor gain their ends any better than comparable serious speeches do. Further, the state of objectivity requisite for the humorous experience may in reality be harmful to a speaker's purpose. If one wishes to use verbal language to arouse mirth, he must be aware that humorous situations are emotional situations, demanding the exercise of great wisdom and judgment in the selection and management of both verbal and visual signs.

Microfilm copy of complete manuscript of 247 pages, \$3.09. Enlargements 6" x 8", 10¢ per page. Library of Congress card number MicA54-593.

#### THE CONCEPT OF EQUALITY IN THE SPEECHES OF SELECTED SPEAKERS BETWEEN THE REVOLUTIONARY WAR AND THE CIVIL WAR

(Publication No. 7041)

Anthony Hillbruner, Ph.D.  
Northwestern University, 1953

It was the purpose of this study to investigate the genesis and development of the concept of "equality" in the speeches of selected American speakers in the period between the Revolutionary War and the Civil War. The method, which consisted of an analysis of the period and of the speakers themselves, led to sources such as Parrington's Main Currents in American Thought, Shaw's History of American Oratory, and the published speeches of the persons selected. The principal sources were the texts of these speeches. The material was then organized into six chapters as follows:

Chapter I presents a summary of the concept of "equality" in periods prior to the actual beginning of this study: the Greeks and Romans; the Christian-Hebraic tradition; the Middle Ages; the Scholastic period; the English and French philosophers; the American Colonial period; and the pre-Revolutionary era.

Chapter II is concerned with the United States between 1776 to 1812, reporting the principal political, social, and intellectual themes. In the analysis proper, Jefferson was found to advocate an equality which was political in the main; Adams emphasized equality before the law; Madison stood somewhere between Adams and Jefferson in his understanding of the concept; Hamilton did not advocate equality but rather a government by the "rich, the wise and the well-born"; and Ames followed the thermadorian trend of the period by advocating more strongly the rights of property rather than equality.

Chapter III considers the period 1812-1825, and the three justices: Marshall, Kent, and Story. Marshall felt that the minority should govern, while Kent, against equalitarian principles, was mostly concerned with the protection of property. The last of this trio, Story, was concerned at times that equality should prevail, but he too, emphasized

property rights as being more important than the rights of equality.

In Chapter IV, the Jacksonian period was traced historically; and Jackson himself was found to be an advocate of equal rights before the law and more equality of opportunity. Clay wished to keep the equalitarian ideal an abstraction to be looked to but not realized necessarily. In his later period, Webster moved toward more equality before the law and toward a more equal suffrage. Emerson, despite democratic tendencies, believed that the minority was more capable of governing than the majority; and Frances Wright, accepting the equalitarian ideal in practically all its ramifications, attempted to realize it in practice.

The problem of Negro slavery and its relation to the egalitarian motif is the theme of Chapter V. The historical background is first analyzed, and then the speakers of the South and North are evaluated. Of the South, Calhoun, Stephens and James Hammond agreed that slavery - hence inequality - was to be upheld. William Andrew Smith did the same, utilizing Scripture to give his views more credence. In the North, Lincoln suggested that equality was an end to be desired in the future, while his antagonist Douglas was of the opinion that equality was to be given to the whites, but denied to the Negroes. Phillips and Parker accepted whole-heartedly the egalitarian ideal emphasizing racial and social, as well as political, equality.

Chapter VI summarizes the previous chapters, shows the changes in the concept, its development, and its status at the outbreak of the Civil War, and finally concludes by pointing out the viril quality of egalitarianism during the period between the two wars and its steady development from an emphasis upon equality before the law to a greater emphasis upon an equality having political, social, and racial connotations.

Microfilm copy of complete manuscript of 493 pages, \$6.16. Enlargements 6" x 8", 10¢ per page. Library of Congress card number MicA54-594.

#### AN EVALUATION OF THE EDUCATIONAL SIGNIFICANCE OF THE CHILDREN'S THEATRE OF EVANSTON

(Publication No. 7043)

Charles A. Jones, Ph.D.  
Northwestern University, 1953

The Children's Theatre of Evanston, Illinois, was established in November, 1925, and it has been in continuous operation since that date. During that period it has attained a top rank in that field of dramatic endeavor. The fact that this theatre is sponsored jointly by the School of Speech of Northwestern University, the Boards of Education of Districts 75 and 76 in Evanston, and the Parent Teacher Associations of those districts, and that this sponsorship has been maintained for 27 years, the period covered



by this study, is evidence that the theatre has educational value. However, at no time during this period has any detailed specific analysis of the educational significance of this theatre been made or published. This fact furnishes the reason for the present study.

The purpose, then, of this dissertation is to make a descriptive and analytical, not experimental, evaluation of the educational significance of the Children's Theatre of Evanston during the years 1925-1952.

In order to make such a study it was necessary to determine the criteria of a desirable educational experience during this period, and then to determine if the Children's Theatre of Evanston satisfied these criteria. To conduct the study in the educational frame of reference which has influenced the origin, growth, and development of that theatre the following procedure was established:

1. General education sources were examined to discover the philosophy, objectives, and practices during this period.
2. Since the Children's Theatre of Evanston deals primarily with children of the elementary school level, the literature of elementary education was examined for philosophy, objectives, and practices.
3. The literature of Speech Education at the elementary level was examined to determine the nature and scope of that program and to see how children's theatre fitted into it. With the information obtained thus far, it was possible to establish the criteria of a desirable educational experience valid for the period 1925-1952.
4. Next, a study was made of the Children's Theatre Movement which was concurrent in development with the Children's Theatre of Evanston. This examination was made to determine the values and benefits claimed by its proponents for children's theatre activity.
5. All available material concerning the objectives and practices of the Children's Theatre of Evanston was analyzed.
6. Finally, these findings were compared with the criteria of a desirable educational experience established earlier to make a qualitative and quantitative evaluation of the educational significance of the Children's Theatre of Evanston.

The study revealed that modern or progressive educational philosophy was dominant during this period; that it was most completely developed at the elementary level; and that its proponents advocated children's theatre as a method of achieving their objectives.

Speech Education at the elementary level was examined and children's theatre related to it.

The study also showed the concurrent development of the Children's Theatre Movement and modern educational philosophy and the consistency of their objectives. It further showed that the Children's Theatre of Evanston was an integral part of that movement.

Eighteen criteria of a desirable educational experience were formulated and used to evaluate the objectives and practices of the theatre.

The final conclusions of the study were:

1. The Children's Theatre of Evanston was educationally significant.
2. The educational significance of the Children's Theatre of Evanston was high in quality.
3. The educational significance of the Children's Theatre of Evanston was wide in scope.
4. The Children's Theatre of Evanston was educationally significant to the community at large, to the public schools of Evanston and the children who attended them, to the School of Speech of Northwestern University, and to the university students who engaged in Children's Theatre activities.

Microfilm copy of complete manuscript of 130 pages, \$1.63. Enlargements 6" x 8", 10¢ per page. Library of Congress card number MicA54-595.

### THE THEATRE IN RELATION TO ART AND TO THE SOCIAL ORDER FROM THE MIDDLE AGES TO THE PRESENT

(Publication No. 6957)

Daniel Spartakus Krempel, Ph.D.  
University of Illinois, 1953

A culture or social structure can be described in terms of the relationships between the group as a whole and the individuals who make up the group. Similarly, the theatre of a period can be examined in terms of its relationship, through its conventional means of presentation, to the individuals composing its audience. Recent studies in the field of art history have pointed up relationships between painting and the other visual arts and their "audiences." Differences in style of pictorial representation have been traced to differences in what the cultures of various periods regarded as "real." This study attempts to show that differences in the conventional means of presentation in the theatre of various periods can be attributed to the same differences in conceptions of "reality."

Medieval theatre, like medieval art, reflected in its conventions the mass-orientation of the collectivist society and the hierarchical conception of the universe which was the "reality" of the period. Both art and theatre were heavily symbolic, and their primary purpose was the narration of the story of man's salvation through Christ. The emphasis in both painting and theatre was on clarity rather than on beauty.

The Renaissance changed the purpose and orientation of art. Artists produced for single patrons. The optical (perspective) approach to art, presenting the appearances of things with scientific accuracy, was the perfect expression of the materialistic world in which it first appeared. It was also an expression of the individualism of the period. The proscenium-arch theatre with its perspective scenery (a perfect illusion only to the "eye of the Duke"), was a spectacular expression of this individual-centered social order.

In Elizabethan England, a predominantly medieval

society produced a theatre form which was basically medieval. In France, civil and foreign wars prevented the development of a successful drama during the "Elizabethan" period, and the "avant-garde" taste of the salons for unified drama prevented the medieval "narrative" dramatic form from developing after peace was restored. The unified drama perfected by Corneille and Racine in baroque France was the dramatic equivalent to the perspective scenery introduced by the Italian Renaissance.

In the eighteenth and nineteenth centuries the bourgeoisie took over the artistic ideals of the nobility along with the privileges of individualism and the control of the government. The development of science affected the arts and the theatre as all aspects of life were subjected to scientific analysis. Archeologically accurate scenery and costumes, realism and naturalism had close ties with the scientific attitude. The time and place conventions of realistic drama closely paralleled the French classicist forms; the realistic actors developed an illusionistic style which finally brought the actor into harmony with illusionistic scenery and drama. Thus the realistic theatre was the culmination of the individual-centered illusionistic tradition introduced in the Renaissance.

Twentieth-century science has destroyed the old materialist world-view and replaced it with a vision of the universe which resembles the medieval conception in many ways. Modern art has returned to the flatness and mass-orientation of medieval art, and the modern theatre has seen many experiments with presentational forms very like the medieval theatre. The motion picture and television theatres, combining illusionistic photography with mass-orientation and conventions analogous to those of medieval art and theatre, exemplify the combined mass-orientation and individualism of modern culture. Since the old functions of the living theatre have been taken over by the photographed theatres, just as photography has replaced the painter in his traditional role, its place in our society must be re-examined.

Microfilm copy of complete manuscript of 373 pages, \$4.66. Enlargements 6" x 8", 10¢ per page. Library of Congress card number MicA54-596.

# A STUDY OF THE SPEECH SOUND ABILITY AND INTELLIGIBILITY STATUS OF A GROUP OF EDUCABLE CEREBRAL PALSIED CHILDREN

(Publication No. 7048)

Ruth Mary Lencione, Ph.D.  
Northwestern University, 1953

This study was designed to explore the speech sound ability and intelligibility status of a group of representative educable cerebral palsied children between the ages of eight years and fourteen years of age for the purpose of determining their speech proficiency. The method aimed primarily: (1) to

test the speech sound ability of these children in order to determine their ability to produce consonant elements and consonant blends, (2) to study the interrelations of abilities with the different sound categories, (3) to analyze errors, (4) to obtain speech intelligibility ratings, (5) to determine whether age relates to speech proficiency, (6) to compare the speech sound abilities of spastics and athetoids, and (7) to compare, insofar as the data warrant, the speech ability of educable cerebral palsied children and non-cerebral palsied children.

The subjects were obtained from eleven public schools for handicapped children in the states of Illinois, Iowa, Indiana, and Wisconsin. One hundred and twenty nine children who had been medically diagnosed as predominantly spastic and athetoid types were studied. The experimental population was divided into seven age groups of 8, 9, 10, 11, 12, 13, and 14 years. The seven age groups were discrete in terms of whole year levels. Each age group consisted of a minimum of seventeen and a maximum of twenty-one subjects.

Information concerning age, sex, type of involvement, intelligence, speech training, and the occupational status of the subjects' families was obtained from the case files of the school which the subject attended. A complete air conduction pure tone test and the speech evaluation were administered by the writer.

The method used in the speech evaluation consisted of two procedures. The first consisted of administering an especially designed picture card speech sound test consisting of fifty sounds, of which twenty-four were single consonant elements and twenty-six were consonant blends. The consonant elements included twenty-three sounds in the initial position, twenty-two in the medial position, and nineteen in the final position. Of the consonant blends eighteen were in the initial position and eight in the final position. The speech sound test was administered in order to obtain a phonetic record of each subject's accuracy in sound production during repeated trials of the twenty-four consonant elements and twenty-six consonant blends as they occurred in single words.

The data collected for the speech sound test were analyzed to determine the percentage of correct production, omissions, and substitutions for the consonant elements arranged according to: (1) position of the sounds in words; (2) a physiological classification of sounds; (3) voiced sounds and their voiceless counterparts; (4) speech sound ability as it relates to age; and (5) an appraisal of the present sample's speech performance as compared to normative data.

The data collected for the consonant blends was analyzed to determine: (1) correct production of both elements of the blend, (2) omission of both elements of the blend, (3) an evaluation of the manner in which the first and second elements of blends are produced, (4) a comparison of the present sample's ability to produce single consonant elements and two consonant blends, and (5) an evaluation of this sample's ability to produce two-consonant blends with reference to age.



The second procedure used in the speech evaluation consisted of a fifteen minute tape recording of spontaneous speech for each of the one hundred and twenty nine subjects. The procedure employed in eliciting speech consisted of engaging each subject in conversation so that he was encouraged to speak freely and naturally in a spontaneous communicative situation. The purpose of the speech recordings was to secure an adequate sample of each subject's actual speech ability in order to obtain intelligibility ratings. Each subject was classified according to the following four-point rating scale: (1) unintelligible, (2) partially intelligible, (3) moderately intelligible, and (4) intelligible. Intelligibility, in this study, was used to designate understandability and was not intended to refer to intelligibility of the individual phonemes.

The results of the investigation were presented in the following manner: a description of the speech status of the total cerebral palsied sample studied, and a comparison of the speech abilities of the types of cerebral palsy diagnosed as spastic and athetoid.

Microfilm copy of complete manuscript of 244 pages, \$3.05. Enlargements 6" x 8", 10¢ per page. Library of Congress card number MicA54-597.

#### THE COMMUNICATION SURVEY: A STUDY OF COMMUNICATION PROBLEMS IN THREE OFFICE AND FACTORY UNITS

(Publication No. 7057)

Thomas Robert Nilsen, Ph.D.  
Northwestern University, 1953

The purpose of this study was to examine the general communication procedures in three office and factory units to (1) determine the feasibility of studying the internal communication problems of a given organization, (2) devise a method for such study, (3) devise a possible method of describing interpersonal communication problems, and (4) determine possible relationships between communication problems and personnel attitudes and actions. The units studied were a shoe factory, a Naval purchasing office, and a Naval fiscal office.

The philosophy adopted for the study was that the production of goods and services for profit is the purpose of business and industry; employees are more productive and cooperative if they have favorable attitudes toward the job, management, and their fellow workers; such favorable attitudes result when, besides the physical needs, the basic psychological needs of the employees are satisfied in the day-to-day experiences of the work situation. The problem of communication within an industry is an integral part of the larger problem of developing effective human relations the ultimate purpose of which is optimum productivity.

The definition of communication adopted as a working concept was based on Carl Hovland: "Communication is the process of transmitting stimuli

(usually verbal symbols) to evoke response." Wendell Johnson's description of the communication process was adopted as providing a conceptual scheme in which the function of attitudes in communication could be most adequately described. Communication was assumed to be effective, ultimately, to the degree that it contributed to the purposes of the organization in which it occurred. Assuming that employees are more cooperative and productive if they have favorable attitudes, the attitudes engendered by communication processes would be an indication of their effectiveness.

The study was exploratory, with the procedure adopted tentatively. The importance of attitudes and feelings in the communication process seemed to indicate the need for lengthy, permissive interviews with personnel concerned, since it seemed likely that only with such interviews could significant attitudes and feelings be discovered. The procedure was therefore built around lengthy interviews, with, however, a questionnaire used in one phase of the study, and direct observation employed where feasible.

The following are among the major conclusions drawn from the surveys:

1. There was a general lack of awareness of communication as a problem to be studied. In none of the units had any attempt been made to analyze the communications of the organization.
2. The surveys revealed the need for careful study of the communications within a given organization to discover the specific problems of that organization.
3. The surveys revealed that the individual's need for recognition or "ego-enhancement" is one of the most important and pervading factors in the communication problems of a business organization.
4. Another one of the outstandingly important factors in communication problems is the set of assumptions made by the people communicating. Of greatest importance appears to be the assumption of understanding or adequate knowledge which forestalls the inquiry that might lead to better understanding.
5. The techniques of communication are of less importance to effective communication in industry than are the concepts which the speaker and listener have of each other.
6. An important function of communication in industry should be to avoid where possible and alter where not the many misconceptions and misunderstandings that inevitably arise in the day-to-day work situation.
7. Employees vary greatly in their awareness of a lack of communication with management, in their conscious desire for "participation," and in their desire for information about the company.
8. Group meetings held only when specific problems have arisen often tend to put members on the defensive and adversely affect such meetings.
9. Communication problems need to be analyzed and dealt with as a part of the larger problem of human relations.

Microfilm copy of complete manuscript of 471 pages, \$5.89. Enlargements 6" x 8", 10¢ per page. Library of Congress card number MicA54-598.

THE PUBLIC SPEAKING OF  
WILLIAM H. "ALFALFA BILL" MURRAY

(Publication No. 7061)

David Clinton Ralph, Ph.D.  
Northwestern University, 1953

The purpose of this work was to study William H. Murray as a speaker; to consider his speeches against the background of forty years of Oklahoma history and as a part of the national scene; and to show that Murray was an effective speaker always thrilling to hear, who sometimes rose to greatness on the platform. While no limitations of a chronological nature were imposed, the study concentrated upon Murray's career as a public speaker in Oklahoma and on the national scene.

Two very great obstacles presented themselves: the complete lack of original manuscripts or notes of Murray's speaking; and the controversial nature of the man himself. These obstacles made the study difficult, but they did not prevent the arrival at some understanding of this orator.

The study used the combined historical and rhetorical methods of research. Murray and his public speaking were studied against the backdrop of history. In addition, his speeches were subjected to a general rhetorical analysis; and four selected speeches were given a detailed analysis. The study also combined the chronological and topical methods of construction. The chapters were arranged topically, but within the chapters a general chronology was followed.

Chapter One considered the man Murray by describing his development as a political speaker from his birth in 1869 to his retirement as Governor of Oklahoma in 1935. The chapter attempted, also, to picture the mature Murray through a description of his appearance, personality and character, and reputation. Chapter Two dealt with the occasions upon which Murray spoke, the audiences that listened, and their responses to his speeches. Chapter Three considered the major issues which confronted Murray during his career as a political speaker and the speaker's ideas about those issues, as well as the sources of his ideas. Chapter Four described his methods of preparation and delivery, and included material on his voice, appearance, and behavior on the platform. Chapter Five considered the arrangement of Murray's speeches, his use of reasoning and evidence, his audience adaptation, and his style. Chapter Six, which contained rhetorical analyses of four selected speeches, was intended to show Murray at work, preparing and delivering speeches on specific occasions. Chapter Seven contained the rhetorical theories developed by the speaker as a result of his many years of speech-making.

Newspapers and periodicals were the most extensively used source materials in this study, for they provided the most complete picture of Murray the man and the speaker. The Congressional Record was helpful in studying the speeches he delivered during his tenure in Congress; and the collection of material in the Oklahoma Historical Society, which may be termed "The Murray Papers," aided in an understanding of his early life and achievements in Indian Territory.

More personal and intimate information was obtained from interviews with former Governor Murray and persons who knew him well, letters to the writer from persons formerly associated with Murray, Murray's three volume autobiography, and Gordon Hines' Alfalfa Bill - An Intimate Biography.

The study concluded that "Alfalfa Bill" Murray's choice of subject matter, his logical development of that material, his adaptation to his audience, his style, his delivery, and the response he received, made him an effective speaker both in Oklahoma and across the nation, during his more than fifty years of active speechmaking. The speeches he delivered on a variety of occasions and to a variety of audiences aided him in carrying out his political ambitions and in gaining acceptance of his political and economic ideas, although these same speeches probably hurt his reputation with those persons who resented his rural orientation and his rugged behavior and appearance.

Microfilm copy of complete manuscript of 776 pages, \$9.70. Enlargements 6" x 8", 10¢ per page. Library of Congress card number MicA54-599.

THE PREACHING AND SPEAKING OF  
BURRIS JENKINS

(Publication No. 7068)

Harold C. Svanoe, Ph.D.  
Northwestern University, 1953

This study is a rhetorical criticism of the speaking and preaching of Burris Atkins Jenkins (1869-1945), a minister and civic leader of Kansas City, Missouri. It embraces a biography, with emphasis upon those aspects of his life that contributed, or were related, to his speaking and preaching; an analysis of the characteristics of his personality; a study of the general climate of opinion and his relationship to his times; an analysis of his specific audiences and speech occasions; a study of the issues on which he spoke; and an analysis of the rhetorical methods he advocated and employed.

The source material consists primarily of more than four hundred sermon texts, his seventeen books, and innumerable columns in religious journals and newspapers.

Born in Kansas City, Burris Jenkins returned to his native community at age thirty-eight, after having served as minister in Disciples of Christ churches in Indianapolis and Buffalo, and as president,



first of the University of Indianapolis, and later, Kentucky University, now Transylvania College. It was in his native city that he arose to prominence not only as a liberal churchman, but as a war correspondent, newspaper editor, public debater, and spokesman for international peace and domestic reforms. Because of these cosmopolitan interests and his non-sectarian approach to religious subjects, he was generally acknowledged to be "The Town's Pastor."

Before and after World War I, Burris Jenkins was a crusader for the rights of the laborer, advocating such measures as collective bargaining, minimum wage laws, and pensions. He spoke frequently from the pulpit and other platforms on educational reforms, and was a persistent advocate of racial and religious tolerance. It was, however, in his views on religion and recreation, including his introduction, shortly after World War I, of motion pictures and dancing as a part of his church program, that he became the subject of controversy and a recognized leader of "liberal" points of view. His "modernist" position, furthermore, on such subjects as heaven and hell, salvation, and the divinity of Jesus, served to strengthen, on the whole, the position of the religious liberal in the Midwest of the twenties and the thirties.

Following World War I, Jenkins became a fervent spokesman for international peace, embracing such issues as the League of Nations, the World Court, and the cancellation of the war debts. His advocacy of the League of Nations combined with the editorship of the *Kansas City Post* drew him for a brief period into politics; and in 1920, he was selected to nominate William G. McAdoo as the Democratic standard-bearer. His three debates with Clarence

Darrow in 1925 and 1926 on the subjects of the World Court and prohibition, as well as a similar number of debates with Judge Ben Lindsey in opposition to the latter's views on companionate marriage, served also to add to Jenkins' prestige and extend his influence, as did a number of other debates and speech occasions. Through his pulpit and radio ministry as well as these special debates and speeches, Jenkins kept his congregation and much of the Midwest aware of the politico-economic trends, as well as the "liberal" positions on theological subjects.

Acclaimed by many who heard him as a skilled public speaker "unequalled in the Midwest," he consistently evidenced skill in all aspects of the speaking art except that of organization. He strove to arouse thought on widely varied and often controversial subjects by carefully reasoned statements couched in simple language. His voice, which he guarded with care and trained, in part, through reading aloud, was resonant and powerful. His management of the visible aspects of delivery were adjudged faultless by a number of critics, including teachers of speech. These factors, plus the appeal of his colorful personality and his crusading spirit in behalf of the underdog and "the man on the street," secured for him a prominent place as a leader of his community; and as William Allen White observed, he became during the period between the two World Wars "one of the great spiritual voices of the Midwest."

Microfilm copy of complete manuscript of 704 pages, \$8.80. Enlargements 6" x 8", 10¢ per page. Library of Congress card number MicA54-600.

## ZOOLOGY

### BIOLOGICAL STUDIES ON *TETRAMITUS* *ROSTRATUS* PERTY, WITH SPECIAL REFERENCE TO NUTRITION AND AMOEBA-FLAGELLATE TRANSFORMATIONS

(Publication No. 7017)

Morgan McKenzie Brent, Ph.D.  
Northwestern University, 1953

*Tetramitus rostratus* Perty, a coprophilic amoeba-flagellate which had been isolated from a human urine specimen, was cultivated upon a medium consisting of 0.5% Difco Yeast Extract and 0.5% Difco Peptone (YP medium). The protozoan was freed of its associated bacterial flora by sterilization of cysts with inorganic chemicals and established under monobacterial conditions from a clone culture. Thereafter *Tetramitus* could be sterilized by penicillin treatment of monobacterial cultures containing *Micrococcus pyogenes* var. *aureus*.

It was found that the amoebae could be cultivated indefinitely under axenic conditions upon a medium consisting of 0.5% Difco Yeast Extract, 0.5% Difco Peptone and 1.0% Wilson Liver Concentrate (N.F.) with selected species of autoclaved bacteria. Under these conditions the Protozoa attained a population of 150 per cu. mm. in approximately 12 days, following a prolonged lag phase. The liver concentrate could be eliminated with a subsequent reduction in trophic growth, only if killed *Bacillus cereus* or *B. subtilis* was utilized as the bacterial fraction. Other bacteria (*Neisseria catarrhalis*, *Escherichia coli*) could not be substituted for these sporeformers in this medium. It was found that the *B. cereus* cell contained at least two heat-stable fractions necessary for growth of *Tetramitus*; neutral hydrolysis for 30 minutes at 15 pounds pressure yielded a non-dialyzable fraction(s) found in the cell residue and a dialyzable fraction(s) found in the bacterial-cell supernatant. Both of these factors were also stable to autoclaving for an equivalent length of time with 0.1N HCl and were retained in the acid-treated cell residue. Alkaline hydrolysis destroyed the activity of all the fractions. Preliminary attempts have failed to substitute for the factor(s) found in the neutral-hydrolyzed bacterial supernatant by employing selected vitamins, amino acids, purines and pyrimidines.

Good cultures of flagellates could be obtained from the amoeba - *Escherichia coli* combination in one-fourth strength YP broth (equivalent to 0.0008M NaCl); transformation was inhibited by the addition of 0.250M NaCl but not by 0.187M NaCl. Aeration did not seem either to inhibit or to stimulate this transformation. Attempts to obtain flagellates from the two-membered *M. pyogenes* culture were unsuccessful. This may be due to an inhibition by *M. pyogenes* or to the lack of a substance normally produced by other bacteria which can induce trans-

formation. No flagellates were formed from amoebae under axenic conditions, but these amoebae were capable of flagellating when added to cultures of *E. coli* in one-fourth YP broth. Experiments with cultures of different ages showed that there is a greater tendency for flagellation soon after excystment.

A culture containing exclusively flagellates has been maintained for 3 1/2 months in one-fourth YP broth despite attempts to transform this culture into amoebae by changes in oxygen tension, osmotic pressure, pH, temperature and light, and through the use of different bacteria.

Microfilm copy of complete manuscript of 73 pages, \$1.00. Enlargements 6" x 8", 10¢ per page. Library of Congress card number MicA54-601.

### A REVISION OF THE ACROLOPHIDAE (MICROLEPIDOPTERA) OF AMERICA NORTH OF MEXICO BASED ON THE MALE GENITALIA

(Publication No. 6952)

Frank Flinn Hasbrouck, Jr., Ph.D.  
University of Illinois, 1953

The Acrolophidae, a family of moths presumably confined to the Western Hemisphere, have long been badly in need of a systematic revision. In answer to the writer's request for a taxonomic problem, certain members of the staff of the Division of Insect Identification at the United States National Museum suggested a revision of a monographic nature on that segment of the Acrolophidae occurring in America north of Mexico. It was further suggested that this work could be accomplished by reference to the genitalia of the adult males.

The three major phases of investigation were:

- (1) a complete review of the literature, including all of the original descriptions of the genera and species involved; (2) a thorough examination of the existing holotypes deposited in various institutions; and, (3) a detailed morphological study of the male genitalia and cephalic structures. Most of the type specimens were located at the United States National Museum, which the writer visited for several weeks, and the British Museum. The latter institution furnished photographs of genital preparations of its types. The morphological studies for the revision were based upon an accumulation of approximately 2500 adult specimens, largely males, received on loan from about thirty institutions and individuals. Special dissecting techniques and equipment were devised for these studies. Because of a lack of such specimens, very little work could be done on the adult females, and it was found impossible to bring the eggs, larvae, and pupae into the scheme of classification.



The above-mentioned procedures have resulted in a general and satisfactory clarification of the taxonomy of the Acrolophidae. The compilation of bibliographic references has developed into a complete index to the literature referable to the North American segment of this family. The examination of the types has not only made it possible to establish the proper identities and concepts of the previously described species but has also enabled the writer to settle properly numerous problems of synonymy within the group. A number of old species, heretofore regarded as valid, have been placed as synonyms of still older species. The morphological studies have confirmed the great value of the male genital structures for the separation of species. These studies have also revealed the considerable taxonomic value of the cephalic structures in the males.

Twenty-two species and subspecies have been described as new in the revision. It has been determined that a total of forty-eight valid species occur in the area under consideration. Of these, four are complex and may be further subdivided into a total of thirteen subspecies and forms. There has been developed a key to all of the species and subspecies, showing for the first time their natural relationships. Although the previous monogeneric condition of the family has been maintained, eleven species groups representing potential genera have been brought forth. The revision has been provided with more than 200 illustrations of male genital structures. The genitalia of the majority of species have been figured for the first time.

All of the species and subspecies, both old and new, have received thorough individual treatment. For each of these there has been given a complete bibliography (if any), description of the external features, description and figures of male genitalia, location of the type, type locality, statement of abundance and general distribution, individual locality records, sources of material, general remarks, and treatment of synonyms (if any). Although the revision by no means contains the final word on this family, it does represent a marked improvement over the previously existing knowledge of the Acrolophidae.

Microfilm copy of complete manuscript of 419 pages, \$5.24. Enlargements 6" x 8", 10¢ per page. Library of Congress card number MicA54-602.

**STUDIES ON THE LIFE HISTORY OF  
LEPIDODERMELLA SQUAMMATA  
(DUJARDIN, 1841)**

(Publication No. 6979)

Martin Sacks, Ph.D.  
University of Illinois, 1953

The morphology of immature and senile animals is described. The immature animals are distinguished by the fact that numerous birefringent

granules are present in the cells of the gut and that the pharynx measures approximately one-half of the total length, as against one-third of the total length in the adult. The senile animal is slightly shorter and wider than the mature adult, the protonephridia are filled with granules, and the body cavity appears empty and distended.

A statistical analysis of eight dimensions is given for five clones. The coefficients of variation found range from 2.3-6.9%. Significant differences were found between several of the clones for certain dimensions.

The cleavage pattern is described and compared with that of *Neogosseia*. A single polar body is formed and the first cleavage plane is transverse. The cleavage is total, adequal and, following the third cleavage, the pattern is bilateral. The resemblance of the eight-cell stage to that of the eight-cell stage of a spiral cleavage is discussed. Gastrulation occurs at the 32-cell stage and is embolic, consisting of the migration of two cells from the antero-ventral surface to the interior of the blastocoel.

The life history of 77 offspring of a single animal is described. The average number of eggs laid per animal was 3.7, the average time of intra-egg development was 26.6 hours, average time required for the first oviposition was 35.6 hours, average time between succeeding ovipositions was 18 hours and average life span 9.9 days.

The capture of *Gastrotricha* by the aquatic phycomycete, *Zoophagus insidians*, is described.

Microfilm copy of complete manuscript of 70 pages, \$1.00. Enlargements 6" x 8", 10¢ per page. Library of Congress card number MicA54-603.

**EXPERIMENTAL FERTILIZATION OF  
MICHIGAN TROUT LAKES**

(Publication No. 6859)

Howard Allen Tanner, Ph.D.  
Michigan State College, 1952

The data presented are from a program directed towards determining the feasibility of applying fertilizer to unproductive trout lakes and by so doing increase fish production. The program is the latest of several studies in Michigan all of which have been directed towards examining the advantages and disadvantages of fertilizing several types of natural and artificial waters. Six trout lakes lying in the generally unproductive pine plains of the north central portion of Michigan's lower peninsula were selected as the site for the present study.

Biological sampling and measurement of certain chemical and thermal features of the environment in 1948 established the level of standing crops of several groups of organisms and the characteristics of each of the lakes prior to fertilization. Trash fish were removed by poison and brown trout planted in each of the lakes at the same number per acre. Fertilizer was applied to four of the six lakes at

varied rates during the summers of 1949 and 1950. Data collections were continued during the period of fertilization and the effects have been evaluated by comparisons on the basis of before and during fertilization observations and between fertilized and unfertilized lakes.

Analysis of the data using statistical procedures revealed that the position of the thermocline became shallower following fertilization and that the total hardness decreased in the fertilized lakes. Oxygen depletion occurred during summer and winter stagnation periods and was closely correlated with amounts of fertilizer added.

The biological sampling indicated increases in amount of plankton and bottom fauna organisms. Changes in the composition of the bottom fauna and in the depth distribution were observed and the degree of dependence of the trout on the bottom fauna for food was studied.

A complete creel census indicated the yield of trout to anglers and the total net production per acre was calculated from the creel census and a population estimate of the trout present at the end of the program. The trout were killed with a toxicant and

estimates of the population were made on the basis of mark and recovery (Ball, ms.).

It was concluded that trout production could be stimulated with small applications of fertilizer. The small amounts of nutrient material used did not result in winter-kill conditions. It was also concluded that the eutrophying effect of additional nutrients (Hasler, 1947) makes impracticable the fertilization of trout lakes with the exception of small lakes unproductive of trout because of extreme oligotrophic conditions.

Ball, Robert C.

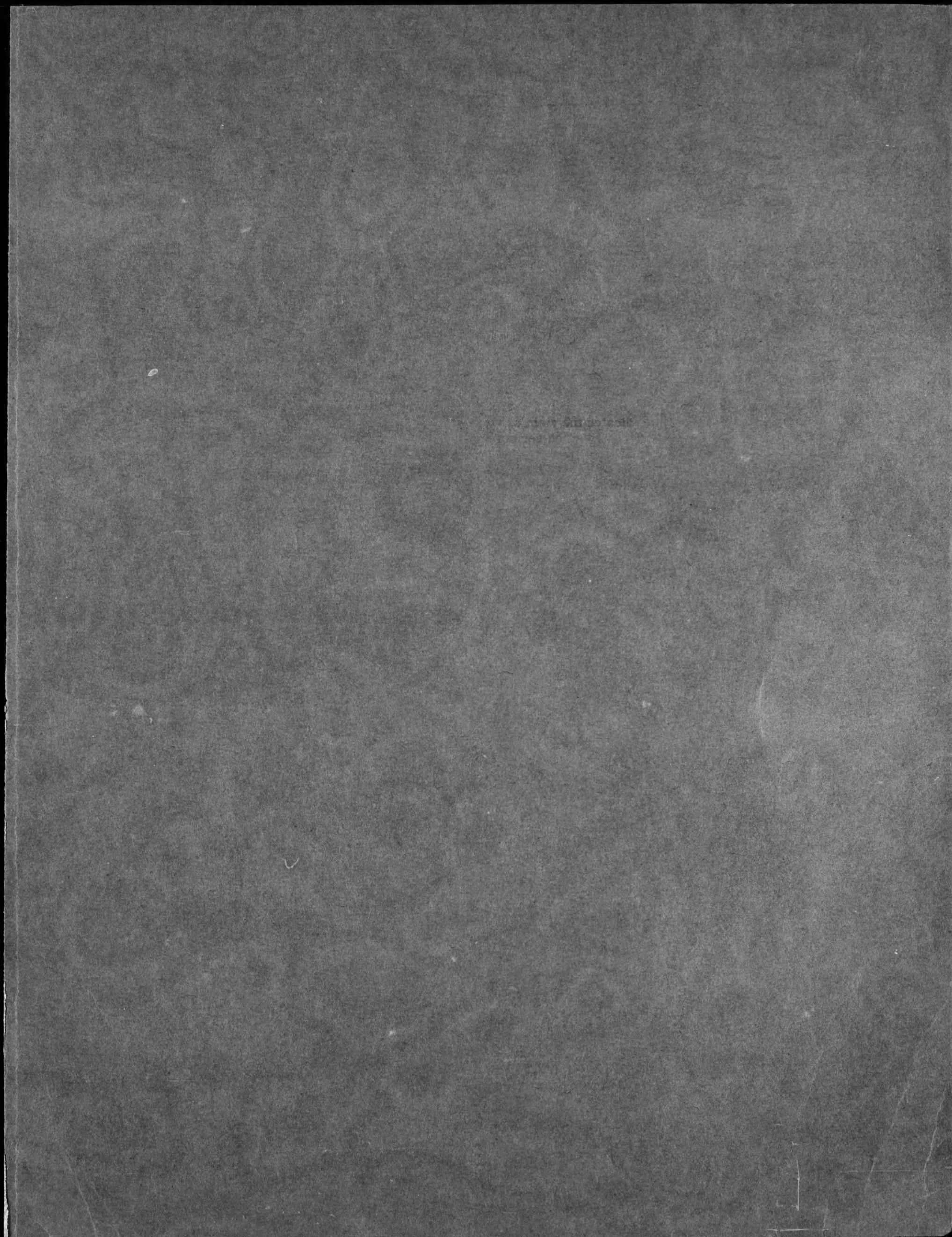
---- Standing crop of brown trout based on recovery of marked fish following poisonings of six trout lakes. (In preparation.)

Hasler, Arthur D.

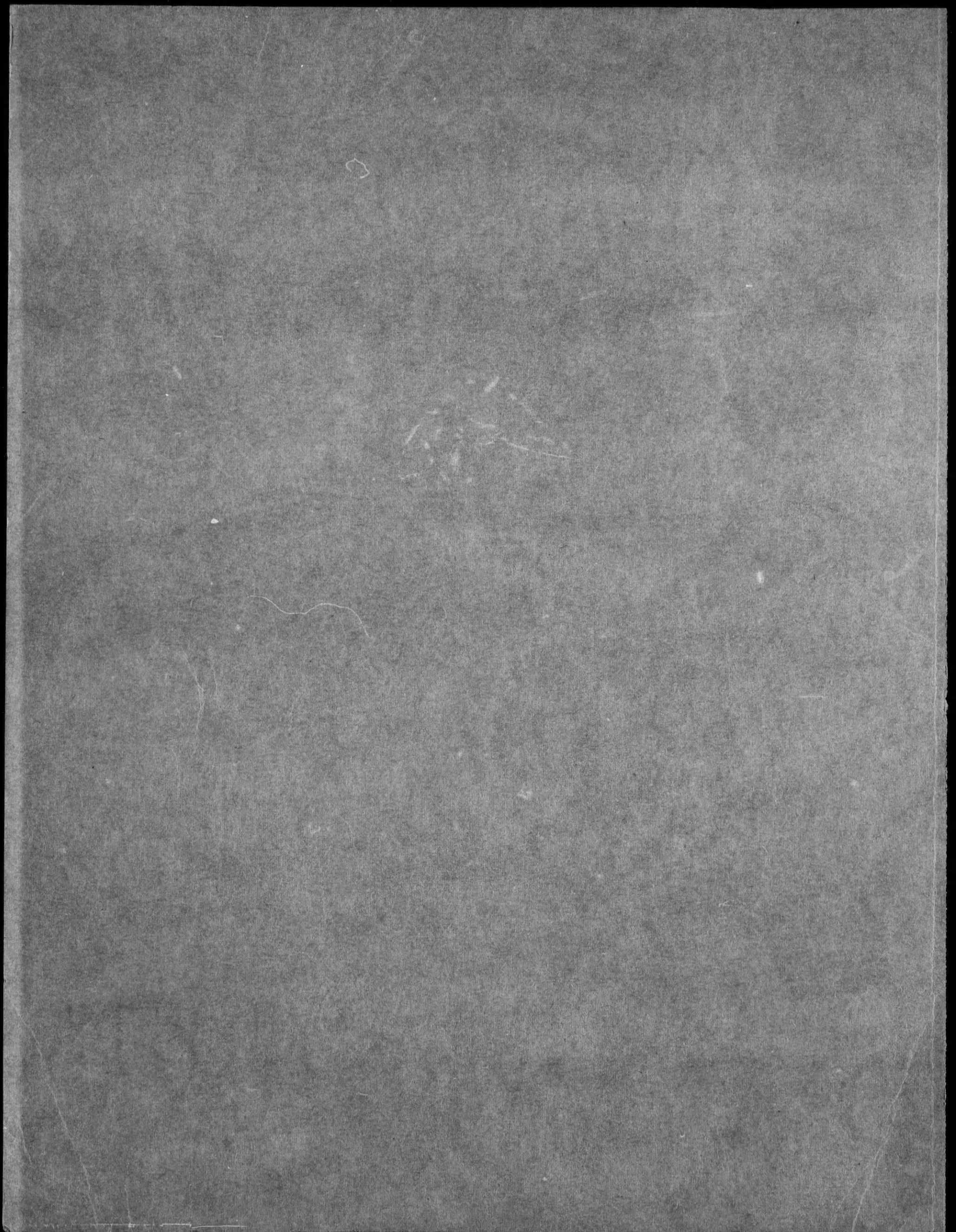
1947 Eutrophication of lakes by domestic drainage. *Ecol.* 28 (4): 383-394.

Microfilm copy of complete manuscript of 221 pages, \$2.76. Enlargements 6" x 8", 10¢ per page. Library of Congress card number MicA54-604.











**DISSERTATION ABSTRACTS**

**Volume XIV, No. 3**

**1954**